A·I·B·S bulletin

NEWS AND VIEWS IN THE BIOLOGICAL SCIENCES

Vol. VII NOVEMBER 1957 No. 5

published by

THE AMERICAN INSTITUTE OF BIOLOGICAL SCIENCES

It costs much less than you think . . .
to outfit your lab for every type of microscopy!

METALLURGICAL POLARIZING BRIGHT-FIELD
STEREOSCOPIC PHASE PHOTOMICROGRAPHY

The proof is a matter of simple arithmetic. For example, for as little as $646.95 — often the cost of a single microscope alone — you may purchase *four* UNITRON microscopes and a photomicrography set. Shown here is a small selection of the many UNITRON models available.

UNITRON POLARIZING — Model MPS

For the study and identification of material structure and characteristics. Revolving, centerable, graduated stage. Individually centerable objectives. Bertrand Lens for examination of interference figures. Coarse and fine focusing. Substage condenser. 2 compensation plates. Strain-free objectives: 4X, 10X, 40X. Eyepieces: Crosshair 5X and 10X, P15X.

MPS $249

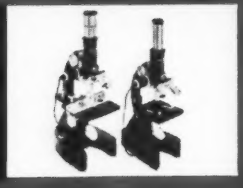
UNITRON METALLURGICAL — Models MMU, MMA

MMU: for metals and opaque specimens and also transparent specimens under both ordinary and polarized light. Vertical, oblique and transmitted illumination. Transformer housed in microscope base. Focusable stage, polarizing apparatus and filters. Objectives: 5X, 10X, 40X, 100X. Eyepieces: P5X, P10X, K15X.

MMA: a simplified version of MMU, 25 – 600X.

MMU $287

MMA $149



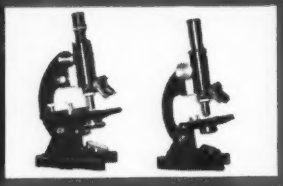
UNITRON PHASE CONTRAST — Models MPE, MPEA

MPE: Indispensable for the study of living cells and other highly transparent material. Continuous transition from phase to bright-field microscopy by adjusting condenser height. Choice of 4 contrasts. Mechanical stage. Three phase objectives: P10X, P40X, P100X. Eyepieces: 5X, 10X, P15X.

MPEA: a simplified version of MPE, 20 – 600X.

MPE $265

MPEA $99



UNITRON PHOTOMICROGRAPHY SET — Model ACA

Duplicates the performance of costly apparatus. Mounting brackets adjust to accommodate your present camera (35 mm., No. 120, No. 127, etc.). Viewing telescope permits all adjustments to be made while camera is in place and allows continuous observation of the specimen, even during time exposures.

ACA $39.95

UNITRON STEREOSCOPIC — Models MSH, MSL

MSH: for inspection, dissecting and other applications requiring a wide-field, 3-D view with great depth of focus. Inclined binocular head with distance and diopter adjustments. Revolving nosepiece. Choice of 3 objectives among 1X, 2X, 3X, 6X. Eyepieces: 8X, 12X, 15X. Models with both high and low stands.

MSL: single-magnification stereo with vertical binoculars.

MSH $267 up

MSL $110

These well known users are among the hundreds that have ordered — and re-ordered — UNITRON Microscopes. There must be a reason!

Harvard University
General Motors Corp.
U. S. Dept'l of Agriculture
Princeton University
IBM Corp.
U. S. Army
U. S. Navy
Columbia University
Nat'l Bureau of Standards
Parke, Davis & Co.
E. I. du Pont
Union Carbide and Carbon
General Electric Co.
Goodyear Atomic Corp.
M.I.T.
Yale University
University of Chicago
Ortho Johnson Chemical
Procter and Gamble
Pittsburgh Plate Glass
Westinghouse Electric
Dow Chemical Co.
Brown University
Arthur D. Little Co.

FREE 10 DAY TRIAL
on any UNITRON MICROSCOPE . . .

Let the instrument prove its value to you in your own laboratory, before you decide to purchase.

THIS COMPLETE CATALOG ON UNITRON MICROSCOPES IS YOURS FOR THE ASKING

This colorful catalog gives complete specifications on the many UNITRON models available. Send for your free copy now.

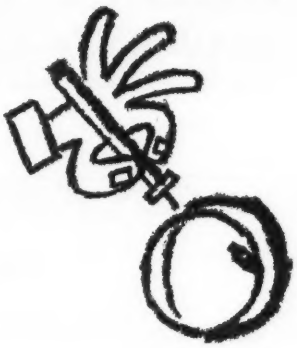
UNITRON

INSTRUMENT DIVISION OF UNITED SCIENTIFIC CO.
204-206 MILK STREET • BOSTON 9, MASSACHUSETTS

Please send me your complete catalog on UNITRON Microscopes.

Name_____
Title and Company_____
Address_____
City_____ State_____

Make a closer examination of these **SAUNDERS BOOKS . . .**



. . . and see how they can enlarge your scope of biological instruction!

Spector—Handbook of Toxicology (Vol. II)

This new volume, **Antibiotics**, is a rich storehouse of vital facts about many of today's most potent disease-fighters. Here, twenty of the world's eminent biologists and toxicologists set forth pertinent data on the physical, chemical, biological and toxicological properties of 340 important antibiotics. The material on *Biological Activity* is particularly valuable since it indicates which organisms a given antibiotic inhibits. Data on *Toxicity* tells you what effect a compound has on various laboratory animals. A conversion table enables you to calculate the probable lethal dosage for humans. Just a few of the many antibiotics covered in this comprehensive work include: *Aspergillin—bacitracin—chloramphenicol—erythromycin — novobiocin — penicillin — streptomycin — tetracycline — rosein II—sulfactin—etc.*

Edited by WILLIAM S. SPECTOR. Prepared under the direction of the Committee on the Handbook of Biological Data, Division of Biology and Agriculture, National Academy of Sciences, The National Research Council. *Principal Contributors:* JOHN N. PORTER, Ph.D., and GILBERT C. DE MELLO, Research Division, American Cyanamid Company. 264 pages, 8½" x 11". $6.00. *New!*

Arey—Human Histology: A Textbook in Outline Form

Virtually a road map through the wilderness of histology, this remarkable new text is designed to supplement standard works—aiding student understanding and organization of data in this complex field. Though written in narrative style, sentences are arranged in a descriptive outline form. Thus the student can see at a glance the framework of a given area of histologic science and the relative importance of facts relating to a particular type of tissue. A brief introduction to each tissue and organ serves as a quick preview of the full discussion to follow. A practical summary following each section aids interpretation and diagnosis. The essential relations of function to its known structural basis are pointed out, taking care not to wander too far into physiological and clinical fields. In addition, the essence of known information on the regenerative capacities of tissues and organs is summarized.

By LESLIE BRAINERD AREY, Ph.D., Sc.D., LL.D., Robert Laughlin Rea Emeritus Professor of Anatomy, Northwestern University. 328 pages, 7" x 10". About $6.50. *New—Just Ready!*

Carpenter—Immunology and Serology

Here is a concise text specifically covering infectious disease and the properties and behavior of antibodies formed within an animal in response to foreign antigenic substances. It offers your students helpful tools which assist in the classification of bacteria, plants and animals, and the identification of their components. The author covers the types of immunity, the nature of infectious disease, normal protection and susceptibility, laboratory production of antiserums, chemical nature of antibodies, the role of lymphoid tissues and plasma cells in antibody formation, response to antigenic stimuli and the Rh factor. A major portion of the book is devoted to serology and the technique by which antigen-antibody reactions are studied in the laboratory. Antigens are fully discussed—classes, detection, properties and active chemical groups. Many tables and diagrams clarify test results, reactions and structures.

By PHILIP L. CARPENTER, Professor of Bacteriology, University of Rhode Island. 351 pages, 6" x 9¼", illustrated. $6.50.

Cantarow & Schepartz—Biochemistry

Painstakingly revised by the authors to keep abreast of the rapid progress in the field of biochemistry, this popular text emphasizes the integration of biological processes and the various aspects of metabolism. In this *New (2nd) Edition* the authors aim to help students perceive the nature of metabolic interrelations and homeostasis—placing biochemistry in its proper relation to normal and pathologic physiology. You will value the stress placed on the *dynamic* aspects of biochemistry, minimizing the strictly chemical approaches which confuse many beginning students. Abnormalities are included *only* where they help explain the normal. There is new data on such topics as: adrenocortical, thyroid and hypothalamic hormones; structures of insulin, vasopressin and oxythocin; metabolic and nutritional significance of trace elements; neurochemistry; nucleic acids; porphyrins and bile pigments.

By ABRAHAM CANTAROW, M.D., Professor of Biochemistry; and BERNARD SCHEPARTZ, Ph.D., Assistant Professor of Biochemistry, Jefferson Medical College. 867 pages, 6" x 9¼", with 150 illustrations. $12.00. *New (2nd) Edition!*

Gladly Sent to Teachers for Consideration as Texts!

W. B. SAUNDERS COMPANY — **West Washington Square Philadelphia 5**

A.I.B.S. OFFICERS

W. O. FENN
President

•

PAUL KRAMER
Vice-President

•

F. P. CULLINAN
Secretary-Treasurer

•

HIDEN T. COX
Executive Director

EDITORIAL BOARD

RONALD BAMFORD
Chairman

•

T. C. BYERLY
RALPH E. CLELAND
EDMOND J. FARRIS
BOYD HARSHBARGER
LOUIS LEVIN
H. BURR STEINBACH

MEMBER SOCIETIES

American Bryological Society
American Physiological Society
American Phytopathological Society
American Society for Horticultural Science
American Society of Ichthyologists and Herpetologists
American Society of Naturalists
American Society of Parasitologists
American Society of Plant Physiologists
American Society of Plant Taxonomists
American Society of Zoologists
Botanical Society of America
Ecological Society of America
Genetics Society of America
Mycological Society of America
National Association of Biology Teachers
Poultry Science Association
Society for Industrial Microbiology
Society of General Physiologists
Society for the Study of Development and Growth

AFFILIATE SOCIETIES

American Association of Anatomists
American Dairy Science Association
American Genetic Association
American Ornithologists' Union
American Society of Animal Production
American Society of Human Genetics
American Society of Limnology and Oceanography
American Society of Mammalogists
Association of Southeastern Biologists
Biological Photographic Association
International Association of Dental Research
National Pest Control Association
Potato Association of America
Society of American Bacteriologists
Society of American Foresters
Society of Protozoologists
Society for the Study of Evolution
Society of Systematic Zoologists

ASSOCIATES

Abbott Laboratories
The American Tobacco Company
Associated Seed Growers, Inc.
Baxter Laboratories, Inc.
Difco Laboratories
General Biological Supply House
Hercules Powder Company
Hoffmann-La Roche, Inc.
Lilly Research Laboratories
Monsanto Chemical Company
Charles Pfizer & Company, Inc.
Schering Corporation
Squibb Institute for Medical Research
Ivan Sorvall
Upjohn Company
Ward's Natural Science Establishment
F. H. Woodruff & Sons, Inc.

A.I.B.S. BULLETIN

Published by the American Institute of Biological Sciences

2000 P Street, N. W., Washington 6, D. C.

EDITOR: **ILEEN E. STEWART**

VOL. VII **NOVEMBER 1957** **No. 5**

CONTENTS

The Responsibilities of Biologists ..... *H. Bentley Glass* 9

Exploration ..... *Bassett Maguire* 14

New York Botanical Garden ..... *Dorothy E. Hansell* 17

Scientific Manpower in Russia ..... *Wallace O. Fenn* 20

Graduate Training in the Preparation and Presentation of Research Reports ..... *P. W. Wilson* 22

Gatlinburg Conference on Basic Problems of Biological Aging ..... *H. Bentley Glass* 24

Criteria for Preparation and Selection of Science Textbooks 26

Biological Programs at AAAS Indianapolis Meeting 28

1957 AIBS Governing Board Report 29

Across the Editor's Desk 33

From the Societies 43

AIBS Reports 44

Education and Manpower 45

Letters to the Editor 48

Biology Library 49

* * *

COVER. Photo of jellyfish, *Dactylometra quinquecirrha*, taken by William H. Amos (Noxontown Rd., Middletown, Del.).

The A.I.B.S. Bulletin is published 5 times a year in January, April, June, August, and November. Copyright 1957 by the American Institute of Biological Sciences, 2000 P Street, N. W., Washington, D. C. Subscription prices: $2.00 a year (50 cents a copy; August program issue $1.00) and to affiliate members, $1.00 a year; Canada, South America & Central America, $2.50; all other foreign, $3.00. August program issue mailed to participating Society Members only. Address all communications to the Editor, American Institute of Biological Sciences, 2000 P Street, N. W., Washington, D. C. Entered as second class matter at the Post Office, Washington, D. C. Printing and typography: Judd & Detweiler, Inc., Washington, D. C. Advertising rates and information mailed on request.

THE VERTEBRATE VISUAL SYSTEM

By STEPHEN POLYAK, M. D.

1,508 PAGES, 28 COLOR PLATES. 546 ILLUSTRATIONS.
OVER 10,000 REFERENCES.

The Vertebrate Visual System is the first complete summary of existing knowledge of the visual system. Encyclopedic in its scope, this book is the culmination of a lifetime of research by the late *Professor Polyak*.

The Vertebrate Visual System widens our knowledge of many anatomical and structural details of the whole visual mechanism. It shows vision and its anatomical substratum as the most important evolutionary tool of the vertebrates and the most important factor in the emergence of Man from subhuman forms. *Polyak* consistently interprets both specific structures and the whole visual mechanism in terms of their functional and adaptive values.

The contents of the book cover the history of previous investigations, the anatomy, histology, pathology, development, and the physiology of the visual system. By the author of THE RETINA.

$45.00.

UNIVERSITY OF CHICAGO PRESS

Chicago 37, Illinois

The Ronald Press Company

is proud to announce

the acquisition of

the book publishing interests of

The Chronica Botanica Co.

October 1, 1957

Dr. Frans Verdoorn will carry on his invaluable service to the Biological Profession as Consulting Editor for the continuation of the Chronica Botanica publications and related serials under The Ronald Press Company imprint while assuming the important post of Director of the new Biohistorical Institute of his Alma Mater, The University of Utrecht, the Netherlands. We know that biologists around the world will join us in wishing Dr. Verdoorn success in his dual role as Biohistorian and Editor.

Newly Published —

THE EXPERIMENTAL CONTROL OF PLANT GROWTH

By F. W. Went, *California Institute of Technology*

Complete data on building and operating air-conditioned greenhouses and climatic chambers. Book gives growing instructions for plants commonly used in botanical, agricultural experiments. Special reference to the Earhart Plant Research Laboratory at the California Institute of Technology. *Illus.* 373 *pp.* $8.50

POLLEN AND SPORE MORPHOLOGY AND PLANT TAXONOMY

By G. Erdtman

Volume II of *An Introduction to Palynology* illustrates through the use of palynograms and micrographs the pollen and spore morphology of the Gymnospermae, Pteridophyta, and Bryophyta. *147 pp.* (Volume I by Erdtman—*Pollen Morphology and Plant Taxonomy: Angiosperms* also available.) Price to be announced.

Nine Chronica Botanica *Titles*

— again in print . . .

GENERA FILICUM — The Genera of Ferns

By **Edwin Bingham Copeland,** *University of California.* The genera and the families of pteridophytes —a modern account of the ferns and the fern allies of the world. *10 plates, 270 pp.* $6.50

Water in the Physiology of Plants

By **A. S. Crafts, H. B. Currier, C. R. Stocking,** *all University of California.* Nature of water and solutions; role of osmosis in water distribution in plants; water relations. *59 ills., 242 pp.* $6.50

THE CARNIVOROUS PLANTS

By **F. E. Lloyd,** *Emeritus, McGill University.* First comprehensive carnivorous plant study since Darwin's *Insectivorous Plants.* Several hundred illustrations: halftones, line drawings. *352 pp.* $7.50

PLANTS OF THE BIBLE

By **Harold N.** *and* **Alma L. Moldenke,** *N. Y. Botanical Garden.* Reflecting intensive study, this unique book is a modern survey of plants and plant products mentioned in the Bible. *95 ills., 320 pp.* $7.50

Biology of the Pathogenic Fungi

Edited by **Walter J. Nickerson,** *Rutgers University.* The biology, physiology, and biochemistry of some of the fungi pathogenic for man, stressing the implications for disease control. *46 ills., 236 pp.* $5.50

A Short History of the Plant Sciences

By **H. S. Reed,** *University of California.* Growth of the plant sciences from early times to the present. First 'history of botany' written by an American and published in U. S. *37 ills., 323 pp.* $6.50

A Guide to the History of Science

By **George Sarton,** *Harvard University.* Explaining the purpose and meaning of the History of Science, this book is a general bibliographic guide to the whole field and its main subdivisions. *316 pp.* $7.50

The Origin, Variation, Immunity, and Breeding of Cultivated Plants

By **N. I. Vavilov.** *Translated by* **K. Starr Chester.** The last work by an outstanding scientist in the areas of genetics, plant breeding, plant variation, systematics, and evolution. *37 ills., 364 pp.* $7.50

PLANTS and PLANT SCIENCE in LATIN AMERICA

Edited by **Frans Verdoorn.** Concise accounts of agriculture, botany, ecology, forestry, plant pathology, plant breeding, etc., in Central and South American countries. *83 ills., 384 pp.* $7.50

✔ *New* RONALD *Books:*

Principles of PLANT PATHOLOGY

By **Elvin C. Stakman,** Emeritus, University of Minnesota; and **J. George Harrar,** The Rockefeller Foundation

The broad interrelationships between plants as economic resources and the diseases which limit their productivity. Dealing with specific diseases, this newly published book stresses those which are epidemic in character and cause the greatest economic loss. Emphasizing food crops, it evaluates the factors of epidemic development and provides details on disease control in transit, storage, in the field. *165 ills., tables; 581 pp.* $8.00

Biology and Control of THE SMUT FUNGI

By **George William Fischer,** State College of Washington; and **Charles Stewart Holton,** U. S. Department of Agriculture

All recorded information on the smut fungi and their relation to human welfare. Treats their historical aspects, economic importance, phylogeny, morphology, and taxonomy. Host family register of over 1,100 species of 33 genera, cataloging species by host family. *117 ills., tables; 622 pp.* $10.00

Companion Volumes:

Manual of the North American Smut Fungi

By **G. W. Fischer.** *136 ills., 343 pp.* $8.75

THE SMUT FUNGI

A Guide to the Literature, with Bibliography

Also **Fischer.** *387 pp.* $8.50

BIOGEOGRAPHY

AN ECOLOGICAL PERSPECTIVE

By **Pierre Dansereau,** University of Montreal

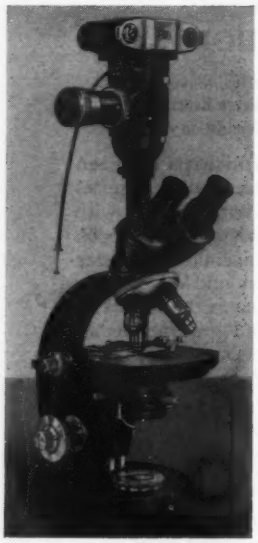
Environmental relationships of living organisms emphasizing higher plants. Book analyzes the components of the biogeographic community in terms of historical setting, climatic tolerance, adjustment to habitat and one another, etc. Applies uniform ecological principles to studies of plants, animals; plant-and-animal societies; man's landscape transformation. *183 ills., tables; 394 pp.* $7.50

THE RONALD PRESS COMPANY • 15 East 26th St., New York 10

CARL ZEISS

STANDARD MICROSCOPE GFL-654-633

MADE IN WEST GERMANY



Carl Zeiss Standard Microscopes are products of nearly a century of experience in design and construction. They are offered in a wide variety of models to suit every purpose, one of which is the GFL-654-633.

It features a special tube and Attachment Camera designed to make photomicrography positive, simple and fast. Its accomplishments in bright and dark field, phase contrast, micro-projection and photomicrography are renown.

Optically and mechanically it is without peer. The Attachment Camera produces standard 35mm pictures, although various adapters for larger sizes may be interchanged. A reflex prism attachment ring and focusing eyepiece assure ease, speed and accuracy.

Write for free detailed literature

CARL ZEISS, INC., 485 FIFTH AVENUE, NEW YORK 17, N. Y.

Guaranteed uninterrupted repair service

For more than twenty years the favorite genetics text—

Snyder and David: THE PRINCIPLES OF HEREDITY

now in a Fifth Edition

"The Fifth Edition is a fine improvement of an already excellent text. It is up-to-date in content as well as in format." *522p. $6.25*

You will want to consider these HEATH books, too—

Brown: BIOLOGY

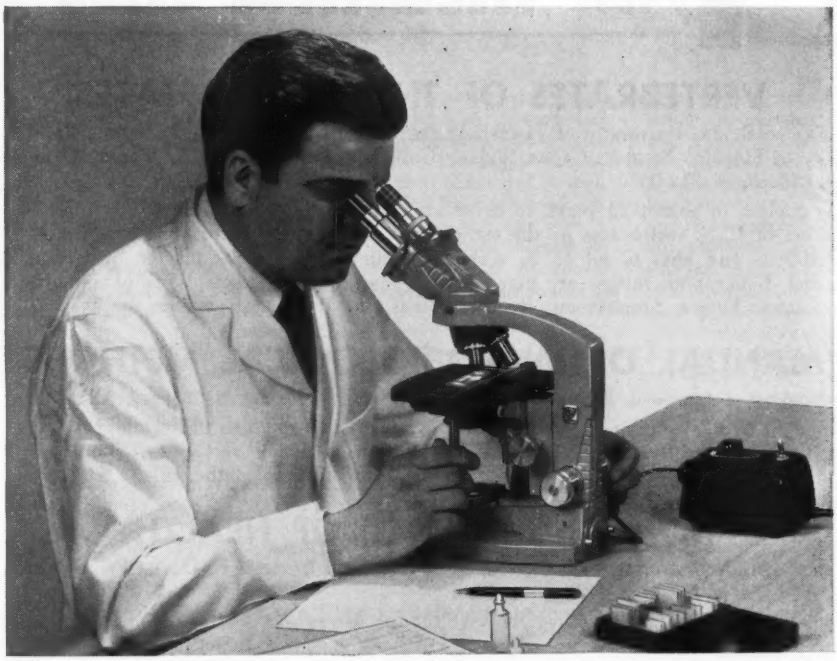
Superior organization. Superior format. Superior content. Beginning with the most familiar and most interesting organism, man, the book covers the entire field in beginning college biology, including Conservation. *666p. $6.75*

Benson: PLANT CLASSIFICATION

"Magnificent, original, beautiful." "A splendid piece of work —the best of its kind I have yet seen." "This beautifully written, beautifully illustrated, beautifully manufactured book is a notable contribution to botany." *704p. $9.00*

D. C. HEATH AND COMPANY

SALES OFFICES: ENGLEWOOD, N. J. CHICAGO 16 SAN FRANCISCO 5 ATLANTA 3 DALLAS 1 HOME OFFICE: BOSTON 16



America's Newest Laboratory Microscopes

SPENCER MICROSTAR

Outstanding Features:

- Advanced styling and design
- Interchangeable and reversible bodies
- Rigid, well balanced arm
- Focusable stages . . . Variable autofocus
- Wide selection of mechanical stages
- Dual cone revolving nosepieces
- Zone of convenience
- Built-in base illuminator
- Top quality optics
- New EPOXY finish

Plus *— Wide variety of accessories and alternate parts . . . readily interchangeable to meet future needs . . . including the new MICRO-GLIDE stage shown above.*

American Optical Company
INSTRUMENT DIVISION, BUFFALO 15, NEW YORK

Dept. W197

Gentlemen:

Please send new MICROSTAR brochure SB 124 and information on the new MICRO-GLIDE stage.

Name_____

Address_____

City_____ Zone_____ State_____

New McGRAW-HILL Books

VERTEBRATES OF THE UNITED STATES

By W. Frank Blair, University of Texas; Albert P. Blair, University of Tulsa; Pierce Brodkorb, University of Florida; Fred R. Cagle, Tulane University; and George A. Moore, Oklahoma A. & M. College. 816 pages, $12.00

The first new manual in almost 25 years, to cover all vertebrate groups this work is intended to facilitate the identification of U. S. vertebrates by the use of keys, descriptions, and ranges. Its aim is to give short, concise descriptions and keys to all U. S. vertebrate animals as well as marine birds and mammals of adjacent waters. Geographic ranges are given for all species, and descriptions of important characters are given for most. Fishes, Amphibians, Reptiles, Birds and Mammals comprise the five parts.

MANUAL OF MICROBIOLOGICAL METHODS

By The Society of American Bacteriologists. Edited by H. J. Conn. 315 pages, $5.50

A manual prepared by the techniques committee of the Society of American Bacteriologists. Ideal for laboratory courses, this supplementary book contains information on various methods of staining, preparation of media, maintenance and preservation of cultures, detection of bacterial pathogenicity, etc.

Meredith's SCIENCE OF HEALTH

By Warren H. Southworth, University of Wisconsin and Arthur F. Davis, Pennsylvania State University. *New Third Edition.* 479 pages, $5.00

This new revision of a popular short hygiene text retains *Meredith's* forward-looking philosophy and the basic organization of the previous two editions, but has many new topics. A new 8-page color atlas of human anatomy makes the sections on anatomy and physiology more meaningful. New information on cancer, alcoholism, heart disease, and the use of narcotics has been added, as well as such topics as radioactive fallout, chemical and biological warfare, eye hygiene and TV, and emergency action to save lives.

Meredith's HYGIENE

Revised by Arthur Davis, Pennsylvania State University, and Warren H. Southworth, University of Wisconsin. Fifth Edition. 906 pages, $6.00

An outstanding college textbook on physical, mental, and social health from personal and public aspects. It places emphasis upon personal hygiene and the responsibility of the individual for protecting and promoting his own health and the health of others. It is extensively revised to include the most recent information from the advanced studies in the health sciences, new interpretations of already known facts, and new relationships between old and new knowledge. It will be valuable as a future reference in family living.

GENERAL ZOOLOGY

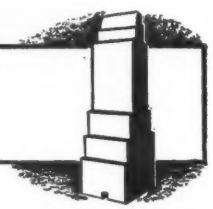
By Tracy I. Storer and Robert L. Usinger, University of California, Berkeley. *McGraw-Hill Publications in the Zoological Sciences.* New Third Edition. 656 pages, $7.50

This new third edition, completely revised with an attractive two column format, provides both a general biological approach and a systematic review, in order to give the student a rational understanding of the structure, function, and life characteristics of animals, as well as an orderly knowledge of animal types. Part I covers the general principles of animal biology. Part II provides a survey of the animal kingdom. Special attention is focused on illustrative material for better clarity and visual appeal.

SEND FOR COPIES ON APPROVAL

McGRAW-HILL BOOK COMPANY

330 West 42nd Street • New York 36, N. Y.



The Responsibilities of Biologists

H. BENTLEY GLASS,*

Biology Department, Johns Hopkins University, Baltimore, Maryland

WE biologists need make no apologies for our calling. To be a biologist is to seek for, to search out the innermost and the uttermost of nature's secrets, the nature of life itself. We live, and in that kinship of life with plants and animals and microbes strive to comprehend what it is that sets us apart from the infinite uncomprehending universe. Carl Becker phrased this thought unforgettably in the last of his three notable lectures at Stanford University twenty-two years ago:

"At some moment, relatively early, in the 150,000 million years which is the sun's span of life, we note that certain bits of matter on the surface of the earth, by virtue of temperatures not elsewhere obtaining, assume unusually complicated forms and behave in unusually unstable ways. We understand that certain of these bits of animated dust distinguish themselves from others, dignify themselves with the name of Man, and take credit for a unique quality which they call intelligence. They are not aware that intelligence is no merit; the reverse rather, since it is only an inferior form of energy which Nature has given them in partial compensation for the extreme rapidity with which the law of entropy (dS/dt is always positive) degrades their vitality. So long as the sun maintains on earth the necessary temperature, these bits of animated matter will no doubt continue to manifest a perceptible movement, a measurable although diminishing energy. But their activities, however long continued, are infinitesimal in extent and impotent in effect, of no consequence to the universe, admittedly one of Nature's indiscretions, worth noting only because rare and unaccountable: of no consequence to the universe, or in the end to them either, since within a brief moment of eternal time the light of the sun will inevitably wane, the earth will grow cold, and all of man's alleged imperishable monuments and immortal deeds will be as if they had never been, nor will anything that then is be either better or worse because of anything that man has ever done or ever wished to do.

"So a cosmic intelligence might estimate human progress, so it might answer the questions: What is the significance of man? What is the meaning of existence? But then what is this cosmic intelligence that thus asks and answers? It is after all the intelligence of man himself. Apart from man, the cosmos merely is; it does not ask or answer questions. The significance of man is that he is that part of the universe that asks the question, What is the significance of man? He alone can stand apart imaginatively and, regarding himself and the universe in their eternal aspects, pronounce a judgment: The significance of man is that he is insignificant and is aware of it. Man, says Pascal, has this superiority: He knows that the universe can with a breath destroy him, yet at the moment of death he knows that he dies, and knows also the advantage which the universe thereby has over him; but of all that the universe knows nothing.

"Of all that, the universe knows nothing. Apart from man, the universe knows nothing at all—nothing of itself or of infinite spaces, nothing of man or of his frustrated aspirations, nothing of beginnings or endings, of progress or retrogression, of life or death, of good or evil fortune. The cosmic view of the universe of infinite spaces, and of man's ultimate fate within it, is man's achievement—the farthest point yet reached in the progressive expansion of human intelligence and power. It is not rightly to be taken as a description of events that are relevant to man's purposes, but rather as an ideal result of those purposes—the manifestation of his insatiable curiosity, his indefeasible determination to know. As such it is less an objective world of fact than man's creation of the world in his own image. It is in truth man's most ingenious invention, his supreme work of art." (*1*)

Man's consuming urges, his profoundest motives, fall alike within the ambit of biology. The need for food and drink, for warmth and light; the quest for health; the desire for sexual companionship and the burden of parental cares; fear of the unknown and the uncontrollable; and curiosity about our environment and our living companions in the struggle to ward off inevitable entropy—all these foci of human life are ours to analyse and comprehend as biologists. We welcome into our company the two great groups of applied biologists, who practiced their arts of medicine and agriculture before biology became a science and transformed each of those pursuits. And we gather together a hundred specialties in order to see the vast Web of Life, to use Darwin's phrase, entire, and count nothing foreign to us that has to do with life or in any way affects the conditions of life.

I have spoken first about the illimitable horizon opened to our eyes because I do not agree with that point of view which regards the social benefits of science as its chief reason for existence. Important as the fruits of science are, I nevertheless believe them to be quite secondary. Science would exist, and biology a noble part of it, without utilitarian byproducts at all—solely because the mind of man is challenged, within these limits of space and time, of matter and of energy, to know: What is this universe? and what am I?

Seen rightly, this is what makes us perforce *biologists*, and not one or another sort of specialist in narrow confines: botanist, zoologist, bacteriologist, geneticist, or whatnot. To gain this comprehensive view of the nature of life it is not enough to be clear in vision; we must also see with sufficient scope, must perceive the entire ramification of relationships. Hence the biologist requires a far broader training than his colleague in the physical sciences. He must know biochemistry and biophysics, and these must be solidly based on a general knowledge of chemistry and physics. He must know geology to understand the soil and the rock strata with their imbedded records of bygone life. He must feel at home in each of those biological areas whose principles and concepts apply to all organisms, especially cellular biology, genetics, evolution, and ecology. To his own chosen field he must bring the insight and breadth of vision stemming from the application to its problems of the principles and concepts of biology as a whole, and of each part of it. No one has stated this more clearly or emphatically than G. G. Simpson, C. S. Pittendrigh, and L. H. Tiffany in the Preface to their new textbook of biology, so fittingly called simply "Life":

"We believe that there is a unified science of life, a general biology that is distinct from a shotgun marriage of botany and zoology, or any others of the special life sciences. We believe that this science has a body of established and working principles. We believe that literally nothing is more important to a rational human being than basic acquaintance with those principles." (*2*)

We biologists are citizens of no mean country!

This, then, is the first responsibility of each biologist—to *be* a biologist, in all the comprehensiveness of that term—to be biologists first and specialists afterwards. Long ago we learned that in the living organism there is no physiological function without its accompanying structure, and smiled wryly at certain naive biochemists' assumptions that the cell is just a "bag of enzymes." Biochemists are no longer so naive, since being startled by the complexity revealed by the electron microscope as existing within their favorite particles, the mitochondria. Yet other biologists persist in a refusal to see that one cannot properly view the details of any chosen object, whether it be the tail of a virus or the head of a worm, the sporangium of a moss or the ovary of a bird, without being

* The author delivered this address at the General Meeting of the August 1957 AIBS Stanford University Convention.

at the same time aware of the whole organism and the fullness of its relations to all else within its environment. A healthy sign of change in the right direction is the organization of a new Department of Medical Genetics at the University of Wisconsin, which is to include not only the genetics of man the victim but also the genetics of the microorganisms that attack him. Another indication is the recent merger of the Zoology and Botany Departments into a single Biology Department at several of our larger and more eminent universities. But a word of caution is due: Difficulties of administration and of personality have often prevented such fusions; in any case, the administrative union of departments is not the end to be sought. At best it is a means to an end. The end itself is the unification of our *disjecta membra*, of our split and splintered programs in the life sciences into a true biology. Especially should the introductory course, in college as well as secondary school, be truly a course in biological principles, concepts, and phenomena. Too many feeble efforts to introduce such courses have foundered on the shoal created by botanists and zoologists throwing mud at one another. We cannot have successful biology courses until we have true biologists who refuse to draw limits within the organic world, who instead persist in emphasizing the unity of life within its diversity and the universal bonds of mutual dependence. Having been educated a geneticist and having taught general biology to college students for more than twenty years, I am continuingly grateful for a training that has compelled me to claim all plants and animals and microorganisms as proper subjects. I may as a consequence know less about Drosophila than I should, but rather more, I hope, about *life*.

I might illustrate the point by enlarging a bit further a point I made a few years ago in the summary to a symposium on phosphorus metabolism. Having never had a course in biochemistry as a student—it would have been hopelessly out of date by now anyway—I suddenly discovered that genetics was becoming so biochemical that I would have to learn a little about it in self-defense. Even my own experiments were sweeping me in this direction. Phosphorus is a good place to begin. What I said then was as follows:

". . . Phosphorus is so clearly and extensively involved, not only in carbohydrate metabolism, but also in that of lipids and proteins, of vitamins and inorganic salts, that the most extraordinary achievement of some future investigator may well be the discovery of a metabolic system in which phosphorus is demonstrably *not* involved. It is the variety, as well as the essentiality, of the functions of phosphorus which stagger the comprehension. Textbooks—by the very best authors (reference upon request)—still say: calcium and phosphorus are necessary in quite large amounts to provide calcium phosphate — the important salt of which the bones are formed. (Finis). The understanding of the roles of phosphorus in metabolism has indeed advanced a long way beyond that rudiment of physiological knowledge. What began with an exploration of glycolysis and certain oxidative coenzymes has spread in uncounted directions. The two chief rewards of the enormous amount of investigation which has resulted . . . are, first, the unparalleled integration of our concepts of metabolism, and second, the vigorous stimulation of further experimental work which has led to new insight into such seemingly unrelated matters as protein synthesis, the photosynthesis of green plants, active secretion in the kidney, and selective ion accumulation." (3)

We look to energy transfer within the cell and find it dependent on adenosine triphosphate (ATP) and uridine triphosphate (UTP) and other nucleotides with energy-rich phosphate bonds. We examine the basis of heredity in the chromosomes and find it to reside in the polynucleotides of deoxyribose nucleic acid, held together by phosphate linkages. We consider protein synthesis and find it to be impossible without the guidance of ribose nucleic acid, likewise held together by phosphate bonds. We study the activities of those most important proteins, the enzymes that govern, so far as we know, all biological reactions, that make the biological chemistry so wondrous in comparison to the chemistry of the test-tube, and we find the enzymes are unable to function without such coenzymes as the di- and tri-phosphopyridine nucleotides to act as hydrogen acceptors. In photosynthesis as in respiration, all the sugars which participate are phosphorylated. Cell membranes require phosphatides to maintain their characteristic permeability. Hormones such as insulin, adrenalin, thyroxin, the steroid hormones, ACTH, act either directly or indirectly on phosphorylation. Muscle will not contract without participation of ATP and of creatine phosphate. Brain will not think without its phosphatides. Are you an evolutionist? Think of the fascinating problem of the difference between the phosphagens, creatine phosphate and arginine phosphate, found respectively in vertebrates and invertebrates; or of the question whether the living cell could ever have evolved prior to the generation of a complex system containing ATP. Are you an ecologist? Think of the significance of the distribution of phosphates in lakes, rivers, and oceans, and in the varied soils upon which man lives and grows his crops. Think of fertility and infertility, exuberance of life and desolation. If it is true, as Bayliss once wrote, that "the essential characteristic of life is incessant change; to produce change, work must be done. The power of doing work is due to the possession of energy"—then it is equally true that in a sense the biological role of phosphorus *is* life. The unity of life is best exemplified by the omnipresence in the living organism of the peptide linkage and the phosphate bond.

My purpose in this paean in praise of phosphorus is not, as it may seem, to call your attention to an overly neglected aspect of biology, only now coming into its own. Rather, I maintain that one could select a hundred such themes or concepts and with equal profit to the understanding and with equal delight trace them throughout all the fields of biology. And this, I also maintain, when done with orderliness and plan, is the study of biology, is the pursuit of biology in laboratory and field. Our first responsibility as biologists is really to be biologists.

Our Responsibilities to our Profession

"This is the century of the biological sciences," wrote Paul Weiss three years ago in an editorial printed both in *Science* and in the *AIBS Bulletin* (4). "The physical sciences have already achieved a high degree of consistency and conceptual maturity. In the life sciences . . . the major job still lies ahead. At the same time, the urgency of the task grows, as mankind looks expectantly to new advances in agriculture, public health, and medicine, whose rational development depends on biological knowledge and understanding." Then he went on to deplore our tendency to split and splinter "into ever more subdivisions of specialization and particularization . . . The unity of life," he said, "must find its true reflection in *unity among the biological* sciences." It was to counteract this centrifugal tendency that both the Federation of American Societies for Experimental Biology and the American Institute of Biological Sciences were founded. Both have prospered; yet this is not to say that all is as well as possible with them. They face similar problems in the future, and if I speak chiefly about the AIBS it is because my own responsibilities have made me more familiar with its problems and because this meeting is a suitable place to consider them.

The AIBS now numbers 21 member societies (two more having been admitted on Saturday), and 18 affiliate societies. Support is received from 17 commercial organizations listed as our associates. The total unduplicated membership now included in member and affiliate societies has reached 55,000, a respectable proportion of all biologists in the United States, for the National Science Foundation has estimated that there are approximately 250,000 scientists in this country, of whom about one-fourth are biologists. Volume II of *American Men of Science* lists only 25,000 biologists. Yet, size itself may constitute a handicap, and what I said in "A Letter to All Biologists," written in 1954, needs to be said once again.

"It has always been hoped that AIBS would become a voice for the biologists of our nation, and this can only be expected if AIBS becomes more truly representative, both by the inclusion of more societies than now belong to it, and also by the fuller and more frequent exchange of ideas and opinions between the AIBS and its member societies. The AIBS may indeed become the voice, but the societies themselves represent the will directing what is to be voiced; and unless biologists reflect

on the crucial problems of our profession and provide the will and the breath, the voice perforce must remain dumb." (5)

There are constantly increasing signs that agencies concerned with professional biological and broader scientific problems are coming to recognize the representativeness of the AIBS. One such indication is a recent contract with the Division of Biology and Medicine of the Atomic Energy Commission to provide for the organization and support of advisory committees and consultation services, paralleling similar services already rendered by AIBS to the National Science Foundation and the Office of Naval Research. Our collaboration with the Federation has been very close; our cooperation with the American Association for the Advancement of Science is evident in the joint sponsorship of this meeting with the Pacific Division of the AAAS. In programs planned for the improvement of professional conditions, such as the Conference of Biological Editors held in early April of this year in New Orleans, editors participated irrespective of the membership of their own society journals in the AIBS. To the National Academy of Sciences and the Division of Biology and Agriculture of the National Research Council we again acknowledge our lasting debt and pledge our fullest cooperation. We participate in the support of the Scientific Manpower Commission and in a number of international collaborative efforts, such as the U. S. National Commission for UNESCO. These, and many other relationships too many to mention by name at this time, testify to the accepted place already won by the AIBS as the voice of the biologists of the country.

There is, notwithstanding all this, a great and growing danger that the individual biologists of this country will not use this voice of theirs to promote the welfare of science, and of biology as a great part thereof. Too many are still heard to say, annually, "What do I get for my dollar from the AIBS?" Too many accept silently and unaware the benefits they are receiving, or perhaps acknowledge them but think that their obligation as biologists is thereby discharged. Fellow-biologists, your dues are only a token of your belief in the purposes of this organization. What can you get anywhere today for a dollar? Not a ticket to a first-run movie or a ball game! In a number of instances more than the full amount of dues paid in by your member society will be required to pay the travel expenses of your representative to this meeting of the Governing Board! The annual budget of AIBS, this year estimated to run $154,000 and actually amounting to approximately $400,000, is provided for by the dues of biologists to the extent of little more than 5 percent of the total. And many of you are contributing less in time and thought to the general advancement of your profession than you are contributing in actual money.

The importance of that 5 percent—I wish it were 10 percent—cannot be exaggerated. It is, as I have said, the token of your belief in the union of biologists for the achievement of our professional aims and the advancement of our professional status. If that token of support were to disappear, all other enterprises of the AIBS would shrivel away too, for they are predicated on the belief that the AIBS represents biology and biologists. Conversely, an increase in the support of AIBS by biologists will certainly not fail to multiply, perhaps tenfold, its present achievements.

First, one more word about funds, and then to the more important matter. I have heard biologists with salaries I knew to be well above $7000 a year complain bitterly about the cost of dues to societies and of subscriptions to their professional journals, and assert—in fact, carry out—an intention to "cut back." Yet, knowing how many society dues and journals I myself have to pay for, and allowing for the fact that such expenses are deductible in computing the income tax, I am positive that such individuals were not allotting as much as 1 percent of their incomes to their own professional costs. In what follows I may be wrong, but when I consider the lowly esteem in which the biologist is held in comparison with, let us say, the chemist or the physician, when I wonder at the fact that a biologist is usually paid less than a master plumber, I believe a large share of the responsibility is clearly our own. Chemists, physicians—yes, and plumbers, too—have built up strong professional organizations or unions to speak for their interests and their principles. To do this they had to tax themselves in a way we biologists have been unwilling to do. I propose, seriously, that we should consider ourselves as shirkers in our professional obligations if we refuse to plow back into the substrate of our own profession somewhat better than 1 percent. I shall even be so bold as to suggest a yardstick: 2½ percent, of which 2 percent might go to scientific organizations and ½ percent to that other most neglected of our professional responsibilities, educational enterprises. More of that last hereafter.

You need only make a few simple calculations on the basis of the number of biologists in the aggregate or belonging to particular societies, to reach the conclusion that any such scale of support would solve all the financial worries of even our most indigent organizations and journals. Yet money is in reality the least of our problems. What we need most is a new attitude on the part of biologists: instead of 'what am I getting?' more of 'what can I give?' in energy, in ideas, in service to the biological sciences and to our profession. The AIBS will be great only when a large proportion of its members share the vision of what it might achieve for biology, when their enthusiasm, their creativeness, and their energies make real "the century of the biological sciences."

Never ask to see the full harvest when the seed is planted! You, as scientists, constantly plead with industry, government, and society not to support applied science only. You urge the significance of basic research done without expectation of socially useful outcome. You point to atomic energy, the outgrowth of Einstein's abstruse relativity theory; to penicillin, the discovery of a laboratory accident; to hybrid corn, the product of a geneticist's curiosity. It ill befits us, in our own professional affairs, to be more narrow-minded. We build for tomorrow!

The Social Responsibilities of Biologists

If we sincerely believe that science is the mightiest force in modern civilization and that "literally nothing on earth is more important to a rational living being than basic acquaintance with those [biological] principles," then we must indeed regard ourselves as seers, dedicated to the true welfare of humanity, to social progress. Few biologists, outside of an occasional leisure thought, seem to think very frequently or deeply about human progress. This is part of the outcome of that unfortunate cleavage in our pattern of training that most commonly makes the scientist into a narrow technician and the student of the humanities or social studies into a scientific ignoramus. It was not so in the beginning of the modern scientific era, when scientists were known as "natural philosophers"; but ever since the 17th century the scientists have continued to become less philosophical and the philosophers less natural, with truly deplorable results.

I refer you again, therefore, to one historian in whom American scientists can take pride, Carl Becker. In the first of those three notable lectures given on this campus in 1935, and entitled "Progress and Power," Carl Becker attempted to define progress in scientific terms. What he concluded had best be left in his own inimitable style.

"At the beginning of the Time-Scale [human history] men and apes are scarcely distinguishable. The Erect-Ape-Men appear to have neither articulate speech, nor traditions, nor accumulated knowledge. They have few means of defense or aggression except the physical force of their bodies and the instinctive aptitudes provided by their biological inheritance. To us they appear to be associating and contending with the apes on fairly equal terms. But if we turn to the end of the Time-Scale . . . we can see at once that something has happened: nothing to the apes, but something to man. The apes look and behave at the end of the Time-Scale very much as they did at the beginning: during 506,000 years they have repeated their activities instead of extending them. But man at the end of the Time-Scale is not what he was at the beginning. He no longer contends and associates with his cousins the apes. He puts them in the Zoo. And if, some fine morning, he should encounter his ancestor *Pithecanthropus* on University Avenue, he would no doubt, failing to recognize the old man, put him in the Zoo also. Imagine then some descendant of *Pithecanthropus* standing in the Zoo, looking up at his remote ancestor

in the cage. In what essential respects do they appear to differ? As biological specimens they appear to us not too unlike; and if the man finds the antics of *Pithecanthropus* amusing, it is chiefly because they parody his own on the less formal occasions of life. If the man should be suddenly whisked to the beginning of the Time-Scale and dropped, naked and without appliances, among his ancestors in Java, the amusement, if any, would not be his. All the biological progress of 506,000 years would lead him swiftly to the final, good or bad, end of extinction. Fortunately for the man, he is not at the beginning but at the end of the Time-Scale, in the Zoo, looking up with amusement at *Pithecanthropus*. The reason he can afford to be amused is a simple one: he is on the outside of the cage, *Pithecanthropus* is on the inside.

"All that has happened to man in 506,000 years may be symbolized by this fact—at the end of the Time-Scale he can, with ease and expedition, put his ancestors in cages: he has somehow learned the trick of having conveniently at hand and at his disposal powers not provided by his biological inheritance. From the beginning of the Time-Scale man has increasingly implemented himself with power. Had he not done so, he would have had no history, nor even the consciousness of not having any . . . Without power, no progress." (6)

Human power, which mounted slowly indeed through the eons of prehistory and somewhat more rapidly after the advent of sword and pen, has gathered momentum with logarithmic sweep since the dawn of modern science. Today it seems to be rocketing into outer space with the incredible energy of atomic fission and fusion.

Power, especially unlimited power, can be more danger than blessing, and what foresight and intelligence we do possess ought to be exercised in safeguarding and channeling it into wise uses. Mankind was not prepared to use and control nuclear power; and I would like to have heard Carl Becker's comments on what, if man is sufficiently foolhardy, may well constitute the last chapter of human history, the terminus of the Time-Scale. Today we stand on the verge of biological discoveries of an equally revolutionary and potentially devastating kind, which it will require all our wisdom to control (7).

It is a frightening responsibility that rests upon us as biologists to see that these powers are used for good and not for harm. We would do well to observe soberly the conscience-stricken efforts of some atomic scientists. For of what we will do with our biological discoveries to alter human life, we are divinely ignorant. This is our ivory tower! And yet a little comprehension of human history and the inescapable nature of human society, of human motives and human values might save us in time.

This is our quandary, and the enigma of our own nature! Of all men we know most fully the nature of sex and its significance among living organisms—and despite this seem to experience as much divorce and marital unhappiness as any other group. Of all persons we know most fully how to banish famine and malnutrition; yet each effort of agricultural biology results in a soaring growth of population that threatens to recreate conditions of hunger or at the least gravely to lower the general standard of living. Of all persons we know most fully how to exorcise the demons of disease—yet every handicap corrected by medical biology multiplies in the population the hereditary factors that are in part or entirely to blame. I would feel no confidence in asking the profession of biology to take over the regulation of our government and our society. There are so few biologists who have gained anything like the required experience by entering into such public affairs as face citizens every day and everywhere. There are so few biologists who endeavor to make their biology count for anything outside the laboratory and the classroom. Yet we say, and we think we believe, that literally nothing is more important than the understanding of these principles and their practical application to human affairs. In this respect the opportunity to work in the developing program of the AIBS is at once a revelation and an apprenticeship. It has been most encouraging, during the past few years, to see more and more biologists entering into these opportunities, taking part in advisory committees to governmental agencies, participating in the program of visiting lectureships at the smaller institutions, taking part in conferences on problems of common concern, working on committees whose primary function is to consider the problems of biology within our society and to create fresh solutions.

Our real social function as biologists, it seems to me, lies in education. If it is true, as Carl Becker thought, that human progress depends on increase in power, it is equally true that this power is neither the inherent power of human muscles nor the evolutionary increase in intelligence. So far as we can tell, innate human intelligence is no greater today than in Cro-Magnon man or perhaps even in Neanderthal man, though brain size, if that be a measure of intelligence, has increased to some extent from the time of *Pithecanthropus*. But certainly there is little if any sign of an increase in native intelligence since the advent of agriculture, some 7000 years ago. Human progress possesses its logarithmic character because of the development of tradition, of writing to preserve the painfully acquired knowledge of the past, of printing to diffuse it, and of science to make systematic efforts to enlarge it. The transmission of knowledge from one generation to the next—education, in other words—has taken the place in cultural evolution of the slower transformations possible through the mutation and selection of the genes. Whether, therefore, we are in any formal sense teachers or not, every biologist, every scientist, is in the broadest sense a teacher, a transmitter of power from one generation to the next.

We have heard a great deal in the past several years of the crisis in science developing in this country because of the dearth of science teachers who, because of poor social recompense for their labor and more remunerative possibilities in other types of work, are forsaking the task of teaching. This is indeed a grave problem, especially at the crucial levels of science teaching in the secondary schools, where young minds are kindled by vision and enthusiasm to see the possibilities of a scientific career. It will within the coming decade become a crucial problem of our time. Yet it is not the only problem facing the scientist as teacher, nor even the greatest one.

Human life is now permeated with science; human civilization rests upon scientific foundations. Yet the vast majority of our people have little understanding of science as a way of thinking or a method of seeking answers to problems. Superstitious awe of the magician—yes, there is far too much of that—but of the avowed adoption of a scientific approach to all sorts of human problems, woefully little. Politically it has been demonstrated that a house divided against itself cannot stand. I affirm that it must also be true that a nation of a microscopically few scientists molding and altering the lives of people, and a populace uncomprehending, superstitious, and resisting likewise cannot endure. Somehow, and soon, mankind must become truly scientific in spirit and in endeavor. Otherwise, oligarchy, and eventual collapse.

My reasoning thus leads me back to the fundamental, primary obligation of biologists as of all other scientists, the stern duty to teach—to spread as widely as possible among both young and old the comprehension of the bases of a scientific civilization. I believe this requires us to undertake a searching inquiry into our present attitudes and methods, and to reform them. I note, for example, general agreement among notable biologists who participated in the summer conference on college biology at Norman, Oklahoma, in 1953, that too much effort is devoted to trying to cover subjects thoroughly, whereas, in Ralph Gerard's words, the "fraction of our emphasis [which] should be placed on teaching the scientific method and attitude" and which should be given major emphasis, receives relatively little attention. The emphasis should be exactly the reverse (8).

Let me not be misunderstood. I do not at all mean to imply that a formalistic drill on scientific methods and attitudes has much value, except for a logician. Ordinary people, regardless of age, learn by example rather than precept. This signifies that our teaching of biology should be centered on what James Bryant Conant pioneered at Harvard as the "case study" approach. To see a problem unfold from its beginnings, to see progress impeded by traditional ways of thought, to learn that scientists make mistakes as well as achieve successes, to observe what experiments brought illumination, and why; to ask, as our revered physiologist 'Ajax' Carlson

would frequently say, "'vat is de evidence"; to observe how frequently the truth of today is a synthesis of opposing counterviews and countertheories held in their time to be irreconcilable—all of this would serve to put biology in its rightful place as one of the great lines of progress of historical man. It would, at the same time, damn forever the legions of biology textbooks which serve up to hapless students a crystallized, anonymous biology seeming to have descended perfect, like the divine city out of heaven, straight from unquestionable authority. How can we make of any science such a travesty as to teach it as though based upon the word of authority?

Similarly, the people learn by doing. One real effort to solve a problem experimentally is worth a thousand admonitions. One effort to describe a biological object with patience, care, accuracy, and insight into the significance of its parts is worth a thousand efforts to memorize foreign terms or label prepared drawings. I am very much afraid that we have repeatedly taken, as biology teachers, the easy way out, particularly in the laboratory, or even by doing away with the laboratory altogether. What we have accomplished is often only to kill whatever budding interest in biology may have survived in our students after their passage through years of health rules masquerading as biology, their common introduction to science in the elementary schools.

If teaching scientific methods and attitudes should be one major objective of our teaching, surely to realize the major problems that exist should be the second. And in this context it matters little whether you say problems, or principles, or concepts, for each of necessity involves the others. Here we should emphasize the physical nature of living substance, the supply and use of energy in living systems, and the levels of organization from cell to organism to social group and community. We must stress the growth and development of living things; their responses, adjustment, and adaptations on all levels from cellular to evolutionary; their reproduction and heredity; and the profound, omnipresent interrelatedness of organisms, with one another and with their physical environments. These principles permeate all biology; they are biology. If the teacher keeps these constantly in mind, it matters less whether the survey be broad or narrow, restricted to a single project or devoted to many. Biology will be taught, the nature of science revealed, and the eager thirst of youth to know aroused instead of being quenched at the start. The gaps can be filled later; the best specialist comes from an enthusiast, not a dullard.

For the general public surely the same educative approach, on a persistent and stimulating level, is needed. How dare we complain at the inadequacies and inaccuracies of scientific reporting in newspapers and magazines unless we endeavor to better the situation ourselves? But how many scientists will trouble themselves to try to write good exposition for the layman? How many, rather, seem to feel that a real scientist demeans himself by doing this, and that he had better be spending his time in the laboratory? The inspiring example of the great Victorian biologist, Thomas Henry Huxley, is little followed in this day and age, although it is beyond question true that our 20th century Americans are desperately more in need of scientific education and understanding than the workingmen before whom Huxley was not too proud to lecture. The result of our attitude is that science is largely portrayed to the American people, if not abroad, by persons who deliberately or unconsciously falsify the values and aims of biological science.

Let me say, in conclusion, a word about the importance of freedom of thought in the growth of science. I do not need to develop the point from a full historical background, for most of us are well aware of that. Science has never, can never, prosper for long except where the mind is free. In the development of scientific freedom the struggle for the broader freedoms of speech and association embodied now in our Bill of Rights, and the struggle for academic freedom in the universities, have been essential. We face new problems in this area which are likely to become critical in the next years. The complete domination of scientific research by the holders of the purse-strings is ominous, even though until now our foundations and government agencies have pursued policies of the most liberal kind. How long may that be expected to continue if the people, and the representatives of the people, feel that science is a useful servant, or slave, to minister to the needs of society as bidden? We have only to look at Soviet Russia to see the answer. Within our universities problems of the domination of scientists threaten to arise in the choice of their experimental problems and the publication of their results, should these chance for example to bear unfavorably on large industries (tobacco or antibiotics) or local interests (butter or guns), or to conflict with deeply held prejudices (racial segregation or religious views). It therefore truly distresses me that we have so few thinking scientists who recognize how much we have gained through centuries of struggle and how much we may lose in a few months, if we fail to defend stoutheartedly the freedom of the mind that is as precious to scientists as to any other scholars. It distresses me, I repeat, that so relatively few biologists are to be found in the ranks of the American Association of University Professors or the American Civil Liberties Union or other organizations that defend the essential freedom of science.

I therefore conclude with words written for another occasion, but equally relevant today:

"From its earliest beginnings the inveterate foe of scientific inquiry has been authority—the authority of tradition, of religion, or of the state. For science can accept no dogma within the sphere of its investigations. No door must be barred to its inquiries, except by reason of its own limitations. It is the essence of the scientific mind not only to be curious but likewise to be skeptical and critical—to maintain suspended judgment until the facts are in, to be willing always, in the light of fresh knowledge, to change one's conclusions. Not even the 'laws' of science are irrevocable decrees. They are mere summaries of observed phenomena, ever subject to revision. And it is the essence of the scientific method to rely only upon observations which may be checked by any competent observer, and to test theories by the verification of predictions based upon them. Science is therefore wholly dependent upon freedom—freedom of inquiry and freedom of opinion. . . .

"Thus science owns a most intimate relation to human freedom. So too the social studies and the humanities serve not merely to underpin our freedom and serve as its foundation, but like science also to create and enlarge human freedom. Democracy is government of, as well as by and for the people, the people who are inescapably individuals, biologically unique. The best government is that which affords to each individual the fullest opportunity to develop his own unique capabilities to their fullest realization, and it is our task as teachers to assist and guide this process. For this we need freedom to think, to investigate, to learn, and to advise. More priceless than all of these, for teacher as well as those taught, is freedom of opportunity. This it is that fundamentally distinguishes the free from the regimented society, democracy from totalitarianism. Is it not self-evident that opportunity to think and to know must precede opportunity to choose and to act? To paraphrase Lyman Bryson, Man cannot choose what he has never heard of. He cannot choose wisely what he has never been free to think about.

"Hence science, which is the chief human tool for enlarging the store of reliable knowledge, is progressively enlarging the sphere of human freedom of choice and opportunity. The freedom of science, today in such peril, is itself necessary for, and indeed creates, the larger human freedom we all desire." (9)

References

1. Becker, Carl. *Progress and Power*, p. 99-102. Stanford University Press, 1936.
2. Simpson, G. G., C. S. Pittendrigh, and L. H. Tiffany. *Life: An Introduction to Biology.* Harcourt, Brace & Co., New York, 1957.
3. McElroy, W. D., and B. Glass, eds. *A Symposium on Phosphorus Metabolism*, Vol. II, p. 914-915. Johns Hopkins Press, Baltimore, 1952.
4. Weiss, Paul. The challenge of biology. *Science* 118: 33-34, 1953; *AIBS Bull.* 4(2): 9, April 1954.
5. Glass, Bentley. A letter to all biologists. *AIBS Bull.* 4(5): 5, October 1954.
6. Becker, Carl. Ibid, p. 18-20.
7. Glass, Bentley. Genetics in the service of man. *Johns Hopkins Mag.* 6: 2-5, 12-16, 1955; *Smithson. Instn Rep. 1955*, 299-315, 1956.
8. *Proceedings of the Summer Conference on College Biology, June 15-19, 1953.* University of Oklahoma, Norman, 1953.
9. Glass, Bentley. Science and human freedom. In *The Inauguration of Otto Frederick Kraushaar*, p. 34-38. Williams & Wilkins Company, Baltimore, 1950.

Exploration

BASSETT MAGUIRE, *New York Botanical Garden*

"EXPLORATION" is a term of broad concept and application. Historically, great voyages and travels have sought to establish trade routes, to acquire land possessions, to open up new territories, to obtain new sources of basic materials, and to seek out new geographical and scientific knowledge. Perhaps the time of classic exploration marked by such heroic episodes as the travels of Marco Polo, Columbus, the transcontinental journey of Lewis and Clark, and the voyage of the H.M.S. Beagle are completely gone. Yet today there remain ever increasing demands for more refined field procedure in natural history, and surely there has never been keener competition in exploration for new sources of raw materials, petroleum, metals, and plants of economic promise than there has been in the past decade. Exploration will remain for some time to come an important tool of modern society.

Although minor field excursion has made important contribution to natural history, for the purpose of this paper the term exploration will apply to the more extended kind of field operation, that of some weeks' or months' duration, involving travel considerably away from one's home base.

In the conduct of exploration, two primary general requisites precede organization and preparation for the expedition, viz., a well considered and selected objective, and an adequate background knowledge of the country or region to be visited, viz., its geology, geography, biological history, language and social customs. The general physical characters of the selected region would predetermine the kind of problems to be met, and hence the requirements of equipment, supplies and foods. Obviously, if an expedition were to be sent to the Arctic, the types of clothing, camp equipment, etc., would be greatly different from those required for an expedition to the tropics.

As it happens, this piece is being written aboard a 300 ton, twin-engined, diesel powered passenger ship, now about 600 miles inland, plowing upstream to the head of large river-craft navigation at Puerto Ayacucho, the capital city of the Territory, built at the foot of the great rapids of the Orinoco in Amazonian Venezuela. Preparation for this trip has been going on for some time. Organization is still in progress. An outline in some small detail, giving the background, objective, organization and preparation of the present trip, may serve to typify one kind of exploration.

Background

A hundred and twenty years ago, Robert Schomburgk, while performing a geographical commission for the Royal Society in London, doing general exploration for the Colony of British Guiana, and collecting large series of plants and animals to be studied and distributed by the Royal Botanic Gardens, Kew, and the British Museum, Kensington, crossed the Tacutú River to visit the old fort of San Joaquim, which lay at the confluence of the Aracuera and Tacutú where the Río Branco, one of the principal tributaries of the Amazon is formed. Traveling northward from Joaquim, Schomburgk traversed rugged terrain dominated by crystalline rocks of the Guayana Shield and intrusive granites. Some fifty miles south of the present Venezuelan-Brazilian frontier, he encountered series of sandstone sediments and associated sedimentary volcanics, and was thus the first European of record to set foot on the eastern region of the Roraima Formation (Martius some years earlier collected on sandstone areas in Colombian Amazonas). Further to the north he reached a chain of exceedingly high sandstone block mountains, the most prominent of which was called by the Indians "Roraima". Schomburgk's descriptions of the terrain and collections from the slopes of Roraima and the surrounding sedimentary plateau, together with material collected on his visit four years later, aroused much interest in England and on the Continent. Subsequently, a succession of European biologists visited the Roraima area, the last of whom was Ernst Ule, circa 1912.

In dugout and on foot during his first visit to the sandstone regions of Guayana, Robert Schomburgk, still under commission of the Royal Society, traveled westerly for some four hundred miles until he made contact on the Orinoco at Esmeralda with the point visited by Humboldt and Bonpland nearly forty years earlier. Schomburgk recognized the sediments of the western mountains of Marahuaca and Duida to be similar to those of the lofty Roraima and its neighbors. Near the beginning of the present century, other travelers, most notably the anthropologist Köch-Grünberg, traversed Guayana, and the geographer Hamilton Rice skirted its

Personnel and equipment of the 1957-58 expedition of the New York Botanical Garden to to the Guayana Highland, Venezuela. Left to right: John J. Wurdack, William M. Keith, Jr., Bassett Maguire, leader, and Mrs. Celia K. Maguire.

periphery. By about 1940 the Venezuelan Government had concluded a geological survey of the Gran Sabana, and Felix Cardona, geographer for the Venezuelan government, was well progressed in his remarkable career of exploration of Guayana. The American Museum expeditions to Mount Roraima near the eastern periphery, Cerro Duida on the Upper Orinoco, and lastly to Auyán-tepuí on the Gran Sabana, from which drops the spectacular Angel Falls, led by the late G. H. H. Tate, had been completed. All of this pioneer work in biology, geology and geography laid a background which defined one of the major physiographic and coincident phytogeographic provinces of northern South America. Thus, there had been completed that long period of pioneer study upon which the present series of New York Botanical Garden expeditions, begun in 1944, rests. This expedition now in progress is the nineteenth to the sandstone regions of Guayana, often fancifully called the region of the "Lost Worlds".

Objective

Early botanical work had demonstrated conclusively that the sedimentary region of Guayana, considered to be of Cretaceous or earlier origin by most contemporary geologists, is the seat of a remarkable self-contained flora of extremely high endemism. The work of the now-active botanists, Schultes, Guatrecasas, Idrobo, Fernandez, Garcia-Barriga, and others, has shown that the vegetation overlying the sandstone [Roraima] sediments of Colombian Amazonas is indeed a continuation and integral part of that of Venezuelan, British Guianan, and Brazilian Guayana, and must, therefore, fall within the physiographic and phytogeographic province of Guayana.

The New York Botanical Garden in 1944 reactivated its interest and began a second series of explorations to this fascinating region for the purpose of doing plant reconnaissance throughout as much of Guayana as is practical to reach. The resulting inventory of the plant resources of the region has become the basis for a continuing series of technical reports, and is expected to become the basis for the floristic treatment of the province. Thus, the nineteenth expedition of the present series of explorations, has for its immediate objective a revisit to Cerro de la Neblina, recently named by ourselves, and its outliers in southwesternmost Venezuela along the Brazilian frontier. The current expedition is expected to extend over a period of some five months.

Organization

Exploration is a costly operation. If the individual or institution planning an expedition has sufficient money, one of the major problems is at the offset obviated. Most planners of exploratory field work are not so fortunate, however, and must develop additional sources of financial support. Given an adequate work plan which sets forth the objectives to be achieved, the adequacy of proposed program, and demonstrates the principal's background preparation and ability to carry the work through to completion, financial support may not be difficult to achieve. Many foundations, research institutions, industrial organizations are prepared to give assistance to the well-conceived project. And, of course, individual friends and private donors often are the most sympathetic sources of support.

A sandstone peak in southern Venezuela, of the type scaled by the New York botanists in order to obtain samples of its unique summit flora.

The present New York Botanical Garden expedition has the advantage of continuity and effort, this being one of a series of explorations for which support and friends have been maintained over a period of years. For obvious reasons, I will not detail here the sources of support for our trips. All of the above-mentioned sources, however, have contributed to our present efforts.

Given assurance of financial security, the next step may well be obtaining official authorizations from the concerned government department or agencies of the country or countries to be visited. Naturally, the requirements of law must be met, and it is well to conclude such necessary understandings and authorizations considerably before any planned departure. The consular offices or the national institutions of common interest with the objectives of the expedition are usually the best sources of advice and instruction. For botanical work in Venezuela it is necessary to obtain passport visa and authorization to enter the country from the Venezuelan Consul. Authorization to do botanical collecting is to be had from the Director of the Botanical Service of the Ministry of Agriculture and Animal Husbandry. To enter into and conduct study within regions where there are protected Indian populations, authorization must be obtained from the Ministry of Justice. And, finally, on entry, one must register with the Security Officers to facilitate travel and transport within the country. It is exceedingly helpful to present a carefully prepared list of all equipment and supplies that are to be used on the expedition for approval by the Consular Office—in our instance, the Consulate-General in New York, who will issue, on agreement, a stamp of approval or "Visto Bueno" for it. Such a "Visto Bueno" is most useful in negotiating customs arrangement on arrival at the port of entry.

Preparation

Details of preparation for an expedition cannot be too precisely or meticulously done. Major categories in preparation are as follows: 1. immunizations, medical and drug supplies; 2. personal clothing and effects; 3. instruments and equipment for scientific work; 4. camp equipment; 5. photographic equipment; 6. clothing and useful articles for guides and porters if the expedition has such requirements; 7. food; and 8. facilities for transport.

1. Immunizations, medical and drug supplies.

Ordinarily, any applicant for a U. S. Passport is given a card of "International Certificate of Inoculation and Vaccination as approved by World Health Organization and The Pan American Sanitary Organization," upon which record of inoculations and vaccinations should be entered. For travel in most American tropical countries, the more important immunizations are those against smallpox, typhoid, yellow fever, and tetanus. Inquiry should be made as to whether typhus and cholera vaccines would be advisable for the country to be visited. For our present purposes, except for the last two diseases, all members of our party have received updated inoculations, and in addition, because of the present danger of epidemic or pandemic Oriental influenza, have obtained before leaving New York anti-flu vaccine. Yellow fever inoculations may be received only from properly accredited Government dispensaries, in New York City at 67 Hudson Street, Manhattan. Care should be taken that a record of all immunizations be entered on the Health Certificate, and signatures be placed on it of the administering physicians.

A carefully prepared and stocked medical kit is essential to the success of an expedition. With the exercise of moderate judgment and care, travel in tropical areas is as safe as living in any city. If one is stricken with malaria or is handicapped by the stricture of dysentery, it is because of his own carelessness. There are a number of effective anti-malarials now on the market. The New York Botanical Garden has

Kaieteur Falls on the Potaro River, British Guiana, within the area under study by the New York Botanical Garden.

successfully used for the entire personnel of its expeditions for a period of ten years the Parke, Davis & Co. anti-malarial Camoquin. As a result of the use of Camoquin as a prophylactic, in only one instance has malaria broken through, and then only of brief and mild occurrence. More recently Camoform with Neomycin and Bacitracin added has successfully been used as an anti-amoebic. Anyone contemplating exploratory work in tropical areas should inform himself very carefully about medical and drug requirements.

Danger from wild animals, particularly poisonous snakes, is minimal in most parts of the American Tropics. Poisonous snakes do occur, but we have encountered them so seldom during the fifteen years of our present tropical program, that we have not considered it necessary to provide ourselves with anti-venoms. We have felt that the ordinary snakebite kit providing tourniquet, lancet and pump is all that is necessary. We have never had occasion to use this equipment.

Biting insects, bete rouge, ticks, etc., are often very abundant and can cause considerable personal discomfiture. The best of repellents seem to be inadequate but should be provided. We have found the Parke, Davis product Caladryl most effective in ameliorating the effect of insect stings and bites, and alcohol sponge most soothing and preventive of infection. Tropical prickly heat, for the afflicted individual, can be most distressing and indeed possibly dangerous. Alcohol sponges and medicated powders will greatly alleviate the distress.

2. *Personal clothing and effects.*

More often one is oversupplied than undersupplied with clothing for tropical field work. In low altitude rain-forests we have found that the best footwear is the stoutest basketball shoes that can be obtained. Where one is wet much of the time and is frequently wading up or across streamcourses, leather shoes or boots are not practical, whereas canvas shoes with thick rubber soles give adequate protection, will permit water to drain off quickly, and are not so subject to mildew. Sturdy khaki or denim pants and shirts, substantial socks, and a cloth hat or cap which will shed rain and dry out quickly complete the essential garb. Some travelers prefer woolen shirts—we have not found them useful. At higher elevations, jackets, sweaters and flannel shirts are most comfortable in the evenings. We do not use raincoats. All such gear is most conveniently carried in a duffel bag. It is desirable to have two or three changes of shirts and trousers, an extra pair of basketball shoes, a pair of comfortable camp shoes or slippers, and cotton or dacron pajamas. Many more sophisticated travelers shave regularly in the bush. We do not do so for two practical reasons. A heavy beard protects the face against insect molestation and exposure. In one's personal kit it is convenient to have always available a small bottle of antiseptic such as merthiolate, bandaids, a small bottle of rubbing alcohol, a small container of desenex or some suitable antifungal powder. Dental floss, where much bush game is to be used, is an essential.

Shelter in rain-forests bush is best provided by canvas tarpaulins, the size to be determined by the number of occupants. A 16' x 18' tarpaulin will provide ample shelter and working space for four individuals. The best bed is a hammock, preferably a woven cotton string of Indian fabrication, and least of all a canvas hammock. A cotton or light wool blanket is useful at low altitudes. Mosquito nets should be ample and completely protective. Such nets prevent objectionable bed companions such as ants, spiders, mosquitoes, etc., from molesting one, and will even provide a refugium if in the daytime the biting flies become excessively severe.

At high altitudes, where the temperature may be depressed to 45° F. or less, we use tents, cots and sleeping bags.

3. *Instruments and equipment for scientific work.*

Obviously the most effective equipment is that with which any party or individual can obtain the best results. For collecting and drying plant specimens much has been written by various competent people, showing the bias of their own procedure. Ours is as follows: we press and dry all specimens in a standard press made up of alternating units of aluminum corrugated driers and two drying felts or blotters. A full press contains 120 units, therefore will hold that many full specimens. The press when full is approximately 36 inches long, and is placed for drying over a folding rectangular drying frame made of light 3-ply pine stock, with sides 18 inches high, elevated on short legs, within which is placed a single burner Coleman Speedmaster gasoline stove. Most specimens will dry completely within eight hours. Succulents, of course, take longer.

All of the presses, pressing paper, manila wrapping paper, cordage, etc., and general supplies are packed in lightweight plyboard boxes or telescoping fibreboard boxes of suitable size to hold the collected plant specimens for return shipment. Plofilm or other plastic sheeting that may be purchased by the yard has been found to be extremely useful in wrapping packages of plants, to prevent absorption of moisture and wetting.

It is presumed that records of ordinary weather data will be maintained, so that standard maximum-minimum thermometers, etc., will be needed. Suitable rain gauges can be improvised from powdered milk tins or others of proper size. A Brunton compass and Taylor, or Short and Mason, altimeters are dependable. We have found Coleman gasoline lamps to be preferable to kerosene lanterns.

4. *Camp equipment.*

At higher altitudes, particularly in sites where forest cover is not available, tents with canvas floors and zippered net fronts are most comfortable. Waterproofed canvas tents are practical if problems of transport are not serious. Otherwise, where weight is a factor, tents made of Egyptian cotton or treated nylon are best, although they are expensive.

Naturally, the size of the party will determine the kind of kitchen gear that is used. Our expeditions usually comprise some twenty to thirty individuals, including porters. Large heavyweight aluminum pots of 12 and 16 quart capacity have been found to be most practical. We do not have separate cooking for principals and porters. Along with the ordinary utensils it is good to provide an eggbeater to prepare milk from the dehydrated concentrate, and a good, sizable meatgrinder. Much of the bush game is tough.

Tarpaulins of various sizes and numbers are essential for cook shelters, shelters for the men, depository for supplies, etc.

5. *Photographic equipment.*

Photographic records are an essential part of exploration. Our own equipment consists of a 16 mm. Bolex moving picture camera, a 3¼ x 3¼ Rolleiflex for black and white film, and two 35 mm. cameras, a Leica and Exakta for kodachrome film. On expeditions of several months' duration, it is well to transport cameras and particularly film in tight boxes that can be sealed, into which may be introduced packets of silica gell to maintain a reduced humidity.

6. Clothing and useful articles for guides and porters.

In many parts of tropical America it is necessary to employ porters for the transport of goods and equipment during the final stages of expeditionary travel. More often Indians, who from small boyhood are trained to carry heavy loads through the forests, provide the best labor. Second to keeping the Indians well and feeding them well, it is necessary to provide them with adequate footwear and clothing, particularly for high altitudes where it is cold at night. Standard supplies, on our expeditions, for each porter consist of a pair of heavy basketball shoes, two pairs of stout denim pants, two denim shirts, a web belt, a sweatshirt, a stout denim jacket, a blanket, a mummybag bedroll, and a machete. So supplied, an Indian porter will give faithful and strenuous service.

7. Food.

Ordinarily, and particularly on extended tours of exploration, it is important to make food requirements both simple and acceptable to all participating principals and porters alike. Staples, such as rice, beans, tinned meats, sardines, coffee, sugar, dehydrated milk, cheese and salt, and in much of tropical America the products of the tubers of manihot known in Venezuela as casabe (in English-speaking areas cassava-bread) and manioco, form the basic foods. For the principals oatmeal and cream-of-wheat for breakfast, a limited amount of marmalade and butter, provide the maximum luxury that transport can afford. Onions, if obtainable, and fresh native fruits supplement the fare. In Venezuelan rivers an abundance of fish is usually to be caught, and in the more remote places a reasonable amount of game can be found.

With such a table there are usually no dietary problems, and seldom are vitamin supplements necessary. We have found that dehydrated foods, with the exception of milk and eggs, are usually not practicable. It is especially essential that food in ample quantity be on hand for all members of the expedition. On the present expedition, based on needs for 2400 man-days, we are providing quantities much as follows: tinned meat, corned beef and ham, 1000 tins; sardines and salmon, 1000 tins; rice, 500 pounds, beans, 300 pounds; refined sugar, 200 pounds; brown sugar, 120 pounds; coffee, 50 pounds; dehydrated milk, 150 pounds; salt, 250 pounds; oil, 10 gallons; casabe, 1000 pounds; manioco, 1500 pounds; cheese, 100 pounds; oatmeal, 50 pounds; cream-of-wheat, 50 pounds; onions, 100 pounds; dried prunes, apricots, and raisins, 100 pounds. These staples will total some 4900 pounds, which together with the few special things, will exceed more than 5000 pounds of food which must be transported nearly 1000 miles of river travel and travel in the bush by foot. They are supplemented by large quantities of fish from the rivers, game from the bush, and fruit and vegetables when obtainable from small farms and gardens in the upper reaches of the river.[1]

8. Transportation.

On the present expedition, when we leave Sanariapo at the head of the great rapids of the Orinoco, we will have, as indicated above, nearly 1000 miles more of river travel to accomplish in our own boats. To move the 5000 pounds of food and equal weight of gear and equipment, and total of 20 members of the expedition, a large "falca" (dugouts some 50 feet long with built-up sides) powered by a 35 horsepower Johnson outboard motor, a smaller "falca" powered by a Johnson 10 horse motor, and four dugout canoes, will make up our flotilla. Arrangements have been made long in advance for the transport of 25 drums (50 gallons each) of gasoline, and 75 gallons of lubricating oil, which are now presumably cached at strategic points on the Upper Orinoco, the Casiquiare, and its tributary, the Pacimoni, where this fuel will be needed on the river trip into the objective and the return again to Sanariapo.

Inclusive of fuel, equipment, supplies and food, the present expedition will have transported for a distance of some 1000 miles a total cargo considerably in excess of ten tons.

[1] A detailed list of supplies for this expedition may be obtained from the author's office at the New York Botanical Garden.

Collection of Plant Specimens

Field practice is as variable as are the natures of the collectors. Some competent practitioners have written rather excoriatingly about the use of vascula. We have used collecting cans successfully. Others preserve collected material in formaldehyde or alcohol, to await later pressing and drying. We feel that the preparation of plants can best be done in the field. We do not use hand presses, except in the confines of our boats during river travel, but prepare our materials as neatly and as effectively as possible under the more efficient protection and facilities of well made camps. Collections are obtained in large series, numbered, wrapped in cloth or large leaves, chiefly of monocotyledonous plants, and carefully packed and transported in large canvas bags, each to be returned to camp in a protected carrying basket by a porter. Attempt is made to collect in series of 5-10 specimens, so that distribution may effectively be made to principal herbaria.

An expedition of the character now mounted should yield for a period of three effective months in the field some 2000 to 2500 collection numbers, with a total of 20,000 or more sheets. It should be pointed out most emphatically that an expedition should not be considered terminated with the successful transport of collected materials back to the home institution. Rather is the project completed only when the material has been studied and reported upon, and the specimens distributed throughout the world.

The New York Botanical Garden

DOROTHY EBEL HANSELL, *Editor, The Garden Journal of The New York Botanical Garden*

AS NO adequate herbarium specimens of the plants which Dr. H. H. Rusby had collected in Bolivia in 1885-86 were available in this country, Dr. Nathaniel Lord Britton, then Professor of Botany at Columbia University, and Mrs. Britton journeyed to the Royal Botanic Gardens at Kew, England, in 1888, to study the collection there. They were so impressed with the Gardens that they returned with the idea of establishing a botanic garden in New York City. They enlisted the interest of the Torrey Botanical Club and Columbia University, and these two bodies in turn obtained the cooperation of forty-eight far-sighted, public-spirited citizens who generously contributed to the sum of $250,000 required by the Act of Incorporation dated April 28, 1891.

The Torrey Botanical Club and Columbia University have maintained their interest through the intervening years and are represented in the Garden's Board of Managers. Further, the Director of The New York Botanical Garden is Professor of Botany at Columbia, and staff members of the Garden of curatorial rank, including Dr. David D. Keck, Assistant Director and Head Curator, Dr. Bassett Maguire, Dr. P. P. Pirone, and Dr. Donald D. Rogers are available for instruction. Graduate students pursue study and research at the Garden for advanced degrees, especially in taxonomic botany, conferred by Columbia. Dr. John Wurdack, associate curator at the Garden, and Dr. Richard Cowan, who recently left the Garden to become associate curator at the Smithsonian Institution, earned their doc-

torates in this manner. On occasion graduate students hold assistantships at the Garden. Currently, William M. Keith, Jr., and T. M. Barkley are graduate assistants under fellowships, working toward advanced degrees. Mr. Keith will accompany Dr. Bassett Maguire, Curator and Coordinator of Tropical Research, and Dr. Wurdack on the forthcoming collecting trip to Venezuela, in which the Schools of Forestry of Syracuse and Yale Universities are participating. This program of advanced study and research is in keeping with one of the purposes for which The New York Botanical Garden was founded some sixty-five years ago.

Just what did the founders have in mind in establishing a botanic garden in the City of New York? The answer to this question is given in the Act of Incorporation:—"for the collection and culture of plants, flowers, shrubs, and trees, the advancement of botanical science and knowledge and the prosecution of original researches therein and in kindred subjects, for affording instruction in same, for the prosecution and exhibition of ornamental and decorative horticulture and gardening and for the entertainment, recreation, and instruction of the people."

I have already mentioned the graduate students who pursue advanced study at the Garden. But there are others who use the Garden's facilities for study and research—botanists from foreign countries as well as from nearby and distant parts of the United States. Alcides Rubeiro Teixeira, Director of Instituto de Botânica, São Paulo, Brazil, pursued studies at the Garden in 1955 under a Guggenheim Fellowship, and is doing so again this year for an advanced degree at Columbia University. Leandro Aristeguieta from the Ministry of Agriculture and Science of Caracas, Venezuela, spent more than a year at the Garden, working for an advanced degree from Columbia University and preparing an account of the Compositae of Venezuela. Brother Alain, a member of the Brothers of the Christian School, of Havana, Cuba, spent three summers at the Garden completing the work—a four-volume series on the *Flora of Cuba*—of Cuba's foremost botanist, Brother León. Others come to consult the taxonomic staff on plant identification, on sources of unusual plant material, and so on.

At their disposal is an herbarium of 2,485,888 specimens. Some 25,500 specimens are added each year, and a similar number go in and out on exchange with other institutions. The Garden has through the years placed special emphasis upon the plant material of North and South America, and its specimens from almost all parts of the United States and from northeastern South America compose the most representative collections to be found in any botanical institution.

The herbarium has been assembled by gifts, bequests, exchanges, purchases, and the vast numbers of specimens brought back by staff members from plant collecting expeditions, particularly from various areas of North American and northeastern South America. These include the early collections of Dr. Britton in the West Indies, of Dr. John V. Small in the southeastern states, and Dr. D. P. Rydberg in the Rockies—all made magistral and pioneer studies in their respective regions.

FIG. I. *Specimen of Coryanthes (aff.) macrantha collected in 1955 at Ayanganne, British Guiana, by Dr. Bassett Maguire; this orchid was originally discovered in 1828 in Caracas, Venezuela, by David Lockhart, then superintendent of Trinidad Botanical Garden.*

In the beginning, Columbia College deposited its herbarium, which included the historically valuable personal herbarium of Dr. John Torrey, here. The herbarium of the College of Pharmacy of Columbia, largely assembled by Dr. H. H. Rusby, and the herbarium of Princeton University are among other large collections on permanent deposit at the Garden. The most recent addition is the Gertrude Simmons Burlingham Collection of some ten thousand specimens, mostly of the fungi *Russula* and *Lactaria*. Her friend and executrix, Miss Gertrude C. Sturges, has established the Gertrude S. Burlingham Fellowship in mycology with a stipend of $700. In 1914 a legacy of $25,000 (current value $37,150) was provided by the will of Maria deWitt Jessup, and the income of this fund is designated for the purchase of herbarium specimens.

A valuable collection of vascular plants —some fifteen hundred mounted specimens—came this year from Dr. A. L. Bernardi, Professor of Botany at the University of Mérida, Venezuela. Dr. Bernardi sought assistance in gaining familiarity with the rich flora of Mérida on the eastern flank of the high Venezuelan Andes, and members of the taxonomic staff are now engaged in making the necessary determinations.

Valuable collections are received at intervals from the Forest Departments of French Guiana and British Guiana for study and identification. Accurate naming of such collections can be done only at an institution that possesses a large reference collection and an extensive library. When determinations are made, they are returned to the senders to be used on the duplicates retained there.

Active exchange relations have been resumed with the Komarov Botanical Institute of the Academy of Science of the U.S.S.R. in Leningrad. In exchange for material from its explorations in North and South America, The New York Botanical Garden is receiving from this large Russian herbarium high-quality material from many corners of the Eastern World previously represented poorly, if at all, in any Western World herbarium.

Results of study and research must be published to be of enduring service. Members of the taxonomic staff are engaged in writing regional floras. Since the appearance of the *New Britton and Brown Illustrated Flora of Northeastern United States and Adjacent Canada*, several other floristic projects have been under way. Dr. Keck has been collaborating with Dr. P. A. Munz, Director of the Rancho Santa Ana Botanic Garden, on a *California Flora*. Dr. Arthur Cronquist, Curator, has been working on a five-volume illustrated *Flora of the Pacific Northwest*—about half will be his contribution, the other half the contribution of three co-authors in the State of Washington; and Dr. Maguire, Dr. Wurdack, and Joseph Monachino are sponsoring and making susbtantial contributions to the *Flora of the Guayana Highlands*.

Other staff members write for or edit the Garden's publications, *Memoirs*, *Brittonia*, *Mycologia*, *North American Flora*, and *The Garden Journal*. *Brittonia* is the official organ of the American Society of Plant Taxonomists and *Mycologia* the official organ of the Mycological Society of America. Dr. H. W. Rickett, Biobliographer, is responsible for *Brittonia*, *Memoirs*, and *North American Flora*. *Economic Botany* became a publication of The New York Botanical Garden on July 1 of this year and is being edited by Dr. David J. Rogers, who was appointed Curator of Economic Botany on that date.

Botanists have the remarkable library of the Garden at their disposal. Some thirty-five hundred persons visited the library in search of botanical, bibliographical, and horticultural information, in addition to which the staff handled several thousand mail and phone inquiries. At the close of the year 1956, the Librarian, Miss Elizabeth Hall, reported approximately 301,500 pieces of unbound material and 62,156 bound volumes, representing one of the

FIG. II. *1. Glottiphyllum compressum—from seed received this year from the Botanical Garden of the University of Stellenbosch, Cape Colony, Union of South Africa. 2. Echinus Maximilianii—from seed received late 1956 from National Botanic Gardens, Hirstenbosch, Cape Province, Union of South Africa. 3. Caladium Argyrites brought back from the Kunhardt Expedition to Venezuela in 1949 by Louis P. Politi, Head Gardener of The New York Botanical Garden. 4. Ilex crenata nummularia received from the Royal Botanic Gardens, Kew.*

most valuable collections of botanical and horticultural works in the world. There are, to be sure, other valuable botanical libraries, but the combination of botany and horticulture is unique. Numbered among the precious possessions are several editions of *Hortus Sanitatis*, dated 1491 through the sixteenth century; the beautiful fifteenth century manuscript, *De Virtudibus Herbarium*, on vellum with illuminated lettering, whose author is known as Macer Floridus; herbals by Johann and Gaspard Bauhin and N. J. Jacquin, and the rarest Jacquin's *Selectarum Stirpium Americanarum Historia*. . . . Vindobonae 1780, with 264 hand-colored plates—only twelve copies of which are known; and *Liber Serapionus Aggregatus*. . . . *Mediciis Simplicibus*, Milan 1473. The last is the oldest printed book in the library. The periodical collection is important as is the collection of seed and nursery catalogues dating back to the early nineteenth century and including complete files of catalogues of some old and notable firms.

The taxonomic section of Columbia University's library, consisting of some five thousand volumes and in 1900 placed here on indefinite loan for the benefit of its graduate students, was the nucleus from which by purchases, gifts, and bequests the Garden's library has grown to its present importance. A significant contribution was made by Dr. John H. Barnhart, appointed librarian in 1907, bibliographer in 1913. Dr. Barnhart traveled extensively in Europe to purchase books, acquiring the duplicates in the library of the Geneva Botanic Garden, as well as books from other botanical libraries abroad. He deposited his own extensive library here, which the Garden later purchased. His bibliographic papers and his biographical index of botanists are valued items in the library.

Other notable gifts include the botanical library of two hundred and five volumes of Dr. David Hosack, founder of the Elgin Botanic Garden, which was presented by New York Hospital; some thirty thousand reprints, the research collection of Dr. R. A. Harper, at one time head of the Botany Department of Columbia University, which he presented to the library shortly before his death; the reprint collections and other papers by Dr. Britton on the flora of the West Indies and Mrs. Elizabeth Britton on mosses, of Dr. Small on the flora, ferns and their allies of southeastern United States, and of Dr. Rydberg on the flora of the plains and the Rockies; the reprint collections assembled through the years by Dr. A. B. Stout on genetics and Dr. B. O. Dodge on mycology and plant pathology; the library of Clarence McK. Lewis, approximately two thousand valuable botanical and horticultural works; and by bequest the libraries, some four hundred botanical and horticultural volumes each, of Eleanor C. Marquard and Sarah Gildersleeve Fife, and the library of Col. J. E. Spingarn, largely books and correspondence on clematis. The most recent bequest is the complete library of the late Dr. E. D. Merrill.

It is hoped that in the not too distant future the library will enjoy more suitable, more convenient accommodations. This year, for the first time in more than twenty years, the roof and dome of the museum building are watertight. As the library is located on the third floor of the museum building, it is easily understood why the library staff and library committee have been compelled, on more than one occasion, to scurry around and rescue books from leaks during a heavy rainfall or snowstorm.

The New York Botanical Garden did acquire fine accommodations for its laboratories, largely through the influence and personal efforts of the Garden's Director, Dr. William J. Robbins. A modern structure, well equipped for research in plant pathology, plant physiology, and microbiology, was completed last year. Investigations are being conducted on the effect of natural gas on trees, on the development of a high analysis, soluble plant food to be applied to foliage, on plant nutrition, on abnormal plant growths, on substances inhibiting bacterial viruses, on the juvenile and adult stages of some woody plants. Dr. Richard Klein, who is studying the genesis of crown-gall tumors, was recently appointed Alfred H. Caspary Curator. This is the first endowed and named curatorship at the Garden, one of its functions is to foster investigations on the relationship of plants to the health and well-being of man and to correlate the resources of The New York Botanical Garden and the work of the curator with the resources and work of the Rockefeller Institute for Medical Research in the indicated area.

"For the culture of plants . . . the exhibition of ornamental and decorative horticulture and gardening, for the entertainment, recreation, and instruction of the people." Carrying out these aims, from the Act of Incorporation, falls upon the gardening and educational departments.

The two hundred and thirty acres in Bronx Park assigned to The New York Botanical Garden are made up of grassland, woodland, gardens and special plantings such as the rose garden with over 7,000 bushes in 80 natural species and 400 horticultural varieties, the extensive Thompson Memorial rock garden, the herb garden, the delphinium and lily garden, the Montgomery conifer collection, the Havemeyer lilac planting, the rhododendron and azalea plantings, the perennial and annual borders, the main conservatory range, and the propagating range and nursery.

Permanent living plant collections total 12,000 and include some fine specimens of magnolias (18 spp.), oaks (32 spp.),

pines (27 spp.), maples (34 spp.), beeches, willows, hawthorns, cherries, dogwoods, idesias, koelreuteria, dove tree, albizzia, and so on. The oak collection, as also the magnolias and beeches, is one of the few mature collections. When the city took over some of the Garden's property for parkway, most of the mature specimens in the arboretum were lost. Young trees, especially different species of maple and ash, have been planted in the last ten years to replace old trees as they die out naturally or are otherwise destroyed. Hemlock seedlings are occasionally planted in the hemlock forest to offset the loss suffered from ice storms and hurricanes and from erosion and loss of ground cover. In one year, three hundred eight-inch diameter hemlocks were destroyed in a "terrific blow."

Figures taken from the annual (1956) report of the Head Gardener reveal the extensive operations of the gardening department: 2,133 packets of seed distributed to 133 institutions (the seed is collected, dried, and packaged); 135,200 plants propagated and raised of which 23,462 were distributed among members of the Garden, schools and institutions, and 29,246 were used for exhibitions in the Main Conservatory. For the November 1956 show, 3,845 chrysanthemum plants were grown—many were trained as cascades and in unusual shapes; for the outdoor October display, 3,645 chrysanthemum plants in 173 varieties. The Garden has a collection of 450 varieties of greenhouse chrysanthemums—the largest in the country and including some not grown commercially.

The main conservatory has been undergoing renovation and reconstruction for the past five years, which has necessitated the frequent moving of tropical and tender plants from place to place. "Many became discouraged after this nomadic existence and gave up the ghost. Hardy individuals survived, and they form the nucleus of our present collection which, with new additions, is now coming along well." "However, it is really nice," continued the Head Gardener, "to see visitors close their umbrellas as they walk through the conservatory." Leaks have now been confined to the roof and dome of the museum building.

The outdoor plantings, the exhibits in the Conservatory and in the Museum Building appeal to professional horticulturists, to amateur gardeners, and to the public in general who visit the Garden in large numbers—more than a million and a half annually. These plantings and exhibitions are for their "entertainment, recreation, and instruction." Many come to observe and study the plant material on their own; others enroll in the educational program which is directed by T. H. Everett, Curator of Education and Horticulturist. Mr. Everett played an important part in developing the living plant collections and gardens.

The New York Botanical Garden offers a Two-Year Course in Botany and a Two-Year Course in Practical Gardening, students who satisfactorily complete these courses are awarded certificates. The Garden offers other courses in plant identification, practical gardening, home landscaping, landscape and flower painting, house plants, flower arranging, nature study for teachers, and so on. Classes are [illegible] by staff members and by other [illegible] their chosen fields. 583 persons registered for one or more courses in 1956.

In addition to the educational program for adults, a youth program was launched last year, providing instruction at a plant workshop on each of three Saturday mornings, concluding on a fourth Saturday with a competitive flower show in which 584 children participated; also eight summer sessions were held in the propagating greenhouses whereby children received instruction in indoor gardening practices, flower arranging and nature study. The program was so successful it was repeated and augmented this year by a course in garden craft, with fifty children assigned plots on which they are growing vegetables and flowers under instruction. A hobby club is held in the main conservatory for children; some adults also take advantage of the opportunity to seek advice from the Garden employee on duty every Saturday from 10 a.m. to 4 p.m. Guided nature walks (the guides being comprehensive mimeographed descriptions keyed to numbers on the plant material) are enjoyed by groups of school children accompanied by teachers or by Boy and Girl Scout troops with their leaders. The youth program is proving to be rewarding in more ways than anticipated.

Wars and their aftermath, inability to get experienced help for grounds and gardens, insufficient funds have recently hampered the full execution of the broad program set for The New York Botanical Garden by its founders. Yet much has been accomplished since the day when Dr. Britton presented the idea of a botanical garden in New York City to the Torrey Botanical Club and Columbia University.

Scientific Manpower in Russia

WALLACE O. FENN, *University of Rochester, Rochester, N. Y.*

LESS than two years have passed since Russia raised the Iron Curtain and welcomed Western visitors to her institutions. The welcome has been a sincere one so far as the individual Russians are concerned. Certainly they have met us halfway and have received us with as much cordiality as we would be likely to offer to them if they should reach our institutions as uninvited guests—and it was in just this unfortunate status that I arrived in Leningrad just after midnight in August 1956 with my wife, Dr. and Mrs. Karl Schmidt,* Dr. Chauncey Leake, and Dr. Fred Hitchcock. We felt rather timid and circumspect as we threaded our way to the taxis through the station still crowded with people in spite of the lateness of the hour. No one seemed to pay much attention to us, however, and we soon relaxed.

From the point of view of the Soviet Government the raising of the Iron Curtain is not so much a genuine welcome to aliens as it is a calculated piece of propaganda, and indeed a most successful one. Our government should counter by making the way easy for Russians to visit our country. This is a most urgent necessity which can do us no harm and much good but it is practically prevented at present by the finger-printing requirements of our laws. Every Russian will tell you that this is an insult to a visitor. For our party of Americans crossing the Russian border in either direction there were almost no formalities and no baggage inspection of any sort. While there is good reason for some of our requirements, the finger-printing is indeed a personal indignity which could and should be eliminated. With the removal of that restriction would come many Russian visitors of all professions eager to see for themselves and eager to improve personal social relations with fellow workers in this country.

The many Americans who have returned recently from Russia have already broadcast their impressions so thoroughly that there is little chance of adding much to our present store of information. To be sure we collected our share of interesting data but our visit could not have occurred at a more unfortunate time for laboratory visits. It was not only the middle of the Russian vacation period but many of the physiologists had not yet returned from the International Congress of Physiology

* *Manuscript submitted before the death of Dr. Schmidt in September 1957.*

at Brussels. Nevertheless in our two-week period we saw nine Institutes and talked with many physiologists, all of whom treated us with cordiality.

During a long day at the Pavlov Institute in Leningrad the Assistant Director, Professor Solovief, served us a very festive luncheon. We were, I believe, the first Westerners to see Professor Orbelli since before the war. He gave us a cordial but rather formal reception in the full dress uniform of a General of the Army in his Institute of Evolutionary Physiology. At Moscow Professor Sarkisov gave us an exuberant welcome at the Brain Institute. At the Academy of Medical Sciences the Vice-President and Professor of Physiology, Professor Chernigovsky and Professor Zakusov, of the Institute of Pharmacology and Chemotherapy served us wine, cakes, and chocolates. Professor Anochin at the Sechenov Laboratory of Physiology received us with two bottles of champagne and presented us with copies of his book and then dined with us at our hotel in the evening. At the magnificent new Moscow State University we saw Professor Voronin in his Institute for Higher Nervous Function and drank tea and wine with Professor Koshtoyantz and his students in the Institute of Physiology. The latter also gave us copies of his book on Pavlov and presented us with the characteristically Russian laquered wooden "duck" dishes as souvenirs of our very pleasant visit. We were impressed by the good quality of much of the research which was going on in these laboratories and the excellence of the equipment.

To be sure, most of the work which we were able to see was patterned more or less closely after that of Pavlov and in this respect it was perhaps somewhat limited in scope. In general, however, it was progressive and in many cases imaginative and original. The professors were cordial and much better informed about American work than we were about Russian publications. The young people seemed friendly and alert and they sometimes spoke to us in English. Herein, in fact, was the most impressive part of the Russian scientific scene. There are many "aspiranti" (doctoral candidates) working in the laboratories and they are a highly select group from many applicants. The contrast in this country is pathetic for it seems necessary to "beat the bushes" for the few who are seeking careers in science. This is the case anyway in the medical and biological sciences. In the remainder of the space allotted to me I should like to offer an explanation for this situation.

How can we explain the strikingly greater supply of scientific man power in Russia as compared to the United States? There are many reasons for this difference, some financial and some social, some well known, and one at least not previously mentioned to my knowledge. In the United States any college graduate can get a good job in industry with a salary as large or nearly as large as could be obtained after four more years of study for a Ph.D. degree. In Russia the salary is more or less doubled at each important rung of the academic ladder and the "doctor" or scientist stands at the top with the maximum prestige and the maximum salary. The ordinary practicing physician in Russia has no doctor's degree but can obtain one after about four to five years more of work including the writing of a thesis based on original investigations. At the end of this time his salary will be twice that of the ordinary surgeon who has just finished his training. Thus learning is highly prized in the Soviet Union and highly rewarded.

All visitors to Russia agree that students take a great interest in books, even technical books. We saw "reading gardens" in Gorky Park in Moscow each equipped with a kiosk full of books for free perusal and the book stand on the sidewalk outside the Hotel National was always crowded with eager buyers interested in highly technical publications. In Moscow State University the Professor of Physiology Dr. Koshtoyantz, can pick the fifteen best students out of a class of 200 each year as candidates for the doctorate in physiology. Ten years ago the Department of Physiology in Rochester had some 25 graduate students in all as candidates for the M.S. and Ph.D. degrees. In 1957 there were seven and in 1958 there will be even fewer. This pathetic difference is not due to less inherent intelligence or intellectual curiosity in the American youth but is due chiefly, I am convinced, to a greater variety of attractive alternative careers which are available in the United States and to the scientific competition offered by the M.D. program. In Russia one might say, with perhaps some exaggeration, that there are few other careers so attractive as study and, in short, little else to do. Hence there is no shortage of scientific manpower.

The force of this argument becomes clear when one tries to list all the jobs in this country which do not exist in Russia. Most numerous perhaps are a large fraction of the jobs in the United States which depend directly or indirectly on automobiles, which are relatively scarce in Russia. This includes directly the manufacture, marketing, repair and servicing of automobiles and indirectly most of the jobs concerned with the automobile tourist trade, including motels, roadside restaurants, gift shops, etc. Further, we can list the ministry and the advertising business and all the jobs connected with cheap "pulp" magazines, bicycles and lawn mowers. There are surprisingly few bicycles and there seem to be no lawn mowers in Russia. The few lawns which exist in public places are rather ragged affairs mowed by women armed with scythes! There are relatively few stores compared to the large number in this country and these carry only standard essential items. Only in the large Government Department Store in Moscow did we see a display of luxury articles, at high prices. The innumerable items dreamed up by American free enterprise and profitably disposed of by high pressure salesmanship are not in evidence. The State commissions the manufacture of essential items only and this does not include many bicycles or even baby carriages. The simple abacus is used uniformly in place of a cash register. Even cosmetics are of minor importance. Some things are made but are priced too high for widespread purchase so that not much of the man power supply is needed for their manufacture. An example of this is chocolates. A cake which would sell for 10 cents in the United States costs $1.50 at the official exchange rate and a one-pound box costs $10.00.

Finally we should list the job of housewife. Since all women are supposed to have a job there must be fewer who simply stay at home to mind the children. Women are seen cleaning the streets, operating the railroads, digging ditches and apparently sharing every occupation equally with the men. All of this contributes greatly to the man power supply and incidentally it breaks down to a large extent the distinction between the sexes. One sees few if any amorous couples displaying their affections in public places and I recall no pictures of beauteous semi-nude females designed as an advertising device. Be that as it may, the Russian women certainly contribute their full share to the scientific personnel. At least half of the medical students are women and they seem to share professional appointments on an equal basis with the men.

At the present time in the United States the regular medical school course attracts most of the best students and leaves relatively few for physiology and the other basic medical sciences. All the glamour and the highest rewards are in favor of the M.D. In Russia the reverse seems to be the case. Most medical practitioners do not have a doctorate and to obtain one they must study three more years and then write an original thesis. The doctorate may be in any one of the medical sciences and the general requirements are the same for all. Presumably all the medical graduates would like to continue for the doctorate but only the best can qualify. All who are accepted as students at any level receive of course an appropriate stipend from the Government. As another possible reason for the attractiveness of an academic career in Russia my travel companion Dr. Schmidt suggested the opportunity for private housing which exists in some of the Institutes, privacy being one of the rarest of luxuries in that country. Under such conditions there is no scarcity of candidates for advanced study in any field and physiology may be particularly popular because of the fame of Pavlov who is idolized by the USSR.

Such are the reasons which seem to me the most important in explaining the ample study of scientific man power in Russia. The question may be raised, however, as to the quality of the large numbers of students so trained, and this is difficult to appraise. In my opinion the top men must compare favorably with our

own. It may well be, however, that in order to graduate large numbers it has been necessary to sacrifice something as to quality. This is indeed indicated in the report of a visit to Russia recently published by Lohwater (Science *125:* 974, 1957) in which he related that many Russian mathematicians were complaining about the low intellectual standards of the young engineers. These men, however, may nevertheless make a valuable contribution to Russian technology and they may take the place of large numbers of college graduates in this country who are receiving *ad hoc* training for their particular jobs in the industries where they are employed rather than in our engineering schools. In my own experience there is room for all kinds of people in science and it can do no harm to train large numbers of second rate students provided there are jobs for them when they graduate and provided they do not interfere with the advancement and higher education of the more talented students.

It is easy then to explain the ample supply of scientific manpower in Russia but it is another problem to suggest a remedy for our own shortages. We certainly do not want inadequately trained physicians to guard the health of our citizens. We certainly do not want to break up our homes and turn our children over to the State so that the mothers can work. And we certainly do not want to give up our free enterprise system in order to channel more men into advanced study.

In the long run there can be no doubt that free enterprise will continue to demonstrate its superiority in terms of actual accomplishment as well as personal satisfaction. I recently talked about this with a professor from Finland who remarked that the Finns hoped that Russia would retain her present social structure indefinitely because with all her natural advantages and material resources, she could become a real threat to the world if she started to exploit her position by a free enterprise instead of a communistic system.

To improve our own position in science we must of course make graduate work as attractive as possible and make sure that no talented students are turned away for lack of financial support. In addition there is reason to hope that in the future the supply of M.D. graduates will be great enough so that after graduation more of them will return to physiology and the basic medical sciences for their careers. Already vigorous efforts are being made by the National Science Foundation and the National Institutes of Health to attract medical students into research by a generous supply of fellowships. In my own institution one fifth of the medical students accepted research fellowships for the summer of 1957—a record number. Without the present requirement for military service for all doctors of medicine there would be less tendency for them to seek advancement in clinical practice and Specialty Boards and more might be induced to work in the basic sciences either with or without a Ph.D. degree in addition to their M.D. degrees. Above all, the public must be educated to recognize original research as equal if not superior to the clinic in prestige value. Some further equalization of financial rewards for the two types of career is also needed. The present efforts of A.I.B.S. to popularize careers in the biological sciences is a remedial factor of great importance in this situation and definite progress is already evident.

For all these reasons we are not likely to lose our present supremacy in science relative to Russia because of scarcity of applicants for advanced study. To maintain this supremacy however we must become familiar with the present Russian contributions by visiting their laboratories and learning their language and reading their papers. An extensive program of translating Russian papers into English, like that supported by A.I.B.S., and the National Institutes of Health, is another important aid in this general effort. Let us not therefore underestimate the Russians from whom we have much to learn.

Graduate Training in the Preparation and Presentation of Research Reports

P. W. WILSON,[1] *Department of Bacteriology, University of Wisconsin*

DISSATISFACTION with the ability of the typical American college graduate to use his native language has long been expressed by critics of higher education. For some time now, this criticism has been directed not only by the opponents but also by the friends of the college and university. Especially selected for attack have been our graduates in science. Editors of technical journals, directors of research, and administrators join with Sir James Barrie in bemoaning that today the scientist is the one with the most to say and the least equipped to say it. When the Committee on Professional Training (American Chemical Society) published its findings (issues of July 7, 14, 21, 1947, of *Chemical and Engineering News*) of a two-year survey on training for the Ph.D. in chemistry, it emphasized repeatedly the relative inability of the average doctorate graduate to speak and write effectively. Of the many relevant comments the following are typical:

"The most glaring defect among Ph.D. chemists is their inability to use the English language well. This applies to the writing of reports as well as speaking ability. Deficiencies in these matters place a serious handicap on the progress of many men in the professional world."

". . . The facility to express one's idea effectively, orally or in writing, cannot be accomplished solely by a freshman course in English composition. It can be accomplished as has been demonstrated by some of the engineering schools, by a complete refusal to accept slipshod presentations . . . it is the responsibility of the entire faculty to persist in a critical attitude toward the effectiveness of the student's expressions whether they be oral or written."

Few are so naive as to believe that this deficiency is restricted to the chemist; graduates of all sciences (and probably the humanities as well) are tarred with the same brush. Several years ago, a special committee of the University of Wisconsin surveyed leaders of the fermentation industry for their ideas of a proper curriculum for training bacteriologists and biochemists for that industry. These leaders disagreed markedly on how much time should be spent on such courses as mathematics, advanced chemistry, physics and foreign language, but *all* emphasized the desirability of additional training in English. A few of their remarks are:

[1] At the New Orleans Conference of Biological Editors, the group assigned to study the *Selection of Material for Publication* considered the question of additional training in scientific writing for graduate students (see report by Bentley Glass, AIBS Bulletin 7: 21-23, June, 1957). The author was one of the members of the panel who was relatively optimistic regarding the chances of success in such efforts basing his views on a course he has taught in the department of Bacteriology at the University of Wisconsin since 1946 (Bacteriology *129:* Presentation of bacteriological reports). Although it was recognized that this type of experimental course may not be feasible in many departments, the members of the group thought an account of it might be of interest to readers of the *Bulletin*.

"It has been my own experience that the ability to write a good report or letter is often lacking in college trained men. This becomes an extremely important matter as soon as a man advances to the point where he has to make contacts with others on his own initiative. A considerable proportion of the business of the larger corporations is conducted by written communications of one sort and another. If these are in bad form or fail to convey ideas briefly and accurately, they interfere with the man's advancement and in general with the conduct of the affairs of the organization. I realize that the art of writing is not easy to teach and that putting out a good piece of writing calls for clarity of thought as well as the ability to set things down in words. However, in my opinion this particular aspect of the education of men who go into industry is worthy of some special consideration."

"It has been my experience that only about one man out of three can write a decent report. Even a great many Ph.D.'s cannot write good English and are rather hopeless in organizing a good understandable report. I would suggest, therefore, that a second year of English be given which would stress writing. I would *not* favor a year of English literature."

Because of such criticism, too often deserved, an experimental course in oral and written reports was begun several years ago in the Department of Bacteriology at the University of Wisconsin. The course is open to senior majors and is a requirement for all graduate students majoring in the department; it can be elected also by those taking a bacteriology minor. It meets for two hours a week for one semester; the first hour is a lecture by the professor in charge, the second a "laboratory" period for student participation. It is not expected that those completing the course will be finished speakers or writers—only that they have the knowledge of how to become at least competent in the use of these tools of research. The course attempts only to provide the students the incentive to continue with the necessary constant application of the principles learned. The challenge is made that if a student will spend as much time during his graduate career in learning to use correct English as he spends on reading of his foreign language, he will be able to write and speak acceptably.

Background

Two basic assumptions are made in planning the course. The first is that the average college graduate has had all the formal courses in English that he needs, that he already possesses knowledge of great potential power if he will learn to use it. True, most of this instruction is far behind him—in grammar and secondary schools and in the first year of college, but this circumstance is not altogether disadvantageous if his instruction has been sufficiently basic.[2] Unfortunately, instructors of English often cannot resist the temptation to regard all students as potential contributors to *The Atlantic Monthly*, *The New Yorker*, or, at least, the local literary magazine. Consequently, training directed at what is a rather artificial goal for the majority of students in the sciences may lead to an almost pathological distaste for writing and speaking. The purpose of this course is to overcome this negative attitude and substitute the feeling that a mastery of English is not only desirable but can be a stimulating experience.

A second assumption is that although formal English courses are essential for the *basic* information, its *application* often may be profitably undertaken by those experienced in writing for a specialized professional group. To the uninformed and lofty query occasionally encountered of, "Do scientists write a special kind of English?", the answer is, "In a sense, yes." Although the value of writing about *My Vacation at the Lake* or *Sunset at Picnic Point* is not denied, such exercises seldom teach a student how to prepare a manuscript that will pass the scrutiny of an editor of a reputable scientific journal. However defensible such criteria are for the judgment of creative literature, their application could lead to disaster in scientific communication.

Lecture

With these assumptions in mind the lecture portion of the course is devoted almost entirely to the special aspects of writing for existing bacteriological and biochemical journals. Their style sheets are examined, and the reasons behind certain differences in style are discussed. The various parts (introduction, description of methods, presentation of data, tables, bibliography, summary) of a scientific paper are studied, and good and poor examples of these are analyzed. Particular attention is directed toward the most effective means for presenting data.

In the lectures dealing with oral presentation, emphasis is given to the short paper (10-15 minutes) since this will be the type most of those in the course will be asked to give for many years. Clarity of presentation both of material and in manner of delivery is stressed. Obviously, slidemaking is an important aspect of this portion of the course. One lecture is devoted to courtesy—what an audience has a right to expect of a speaker and *vice versa*.[3]

Laboratory

In the "laboratory" section, the principles of grammar are reviewed during the first half of the semester through study of an English handbook. Although the students are familiar with such handbooks, few realize their proper use, possibly because at the time of their first introduction to them the idea of a handbook was unfamiliar. Now, aware of chemical and biological handbooks, many for the first time really appreciate the necessity and helpfulness of handbooks and dictionaries. Each week a short quiz is given to test the student's knowledge of the grammar under review. The students keep these and make their own corrections. The purpose of the quiz is not to furnish a grade for the instructor but to acquaint the student with how extensive or sketchy is his knowledge of English grammar. Often this is the turning point in the course for the student—up to now on the basis of his A's, B's and C's in English courses he had assumed that he was reasonably aware of the structure of his native language. He frequently learns that his knowledge at best is incomplete and uncertain. At mid-semester an examination on grammar is given. Although this grade is recorded and is used in making the final grade, its primary purpose is to enable the student to determine how much additional work with the handbook is indicated.

The final "examination" is a library project (honor system) in which the student provides examples from the current literature of good and poor tables, figures —and English. For the latter, emphasis is placed on the location and deciphering of examples of jargon (in the Quiller-Couch sense of the word); unfortunately, the first part of this task is all too easy and the second part all too difficult. In addition the student furnishes information on the technical styles of various journals and prepares a technical report, based on his own research if possible, written for publication in some specified journal.[4]

Starting about the third week of the semester, the students give short oral reports. These are usually based on articles from *The Scientific Monthly*, *American Scientist*, *Endeavour*, or *The Scientific American*; the subject matter is relatively immaterial since the purpose is primarily to give experience in oral presentation. Topics of general interest are favored rather than technical articles since the students are hardly sufficiently experienced to read a technical paper with a great deal of critical understanding.

The second oral report is organized by the students themselves. In consultation

[2] An easy and smug solution is to blame the English teacher for this deficiency in the training of our students and to refer the problem to the department of English. This attitude may be both unrealistic and unfair. Without discussing the points of how often do we insist on high standards of writing in our examinations, term papers and laboratory reports, and how often do we give examinations that require the student to construct sentences, we might examine the evidence in support of the charge. Ten years of experience with groups of students who have taken their undergraduate training in many different colleges have failed to convince me that the graduate student's knowledge of the fundamentals of English grammar is more hazy than that of any other subject taken last at the freshman level—e.g., inorganic chemistry or college algebra.

[3] Briefly, the audience has a right to expect the lecturer to speak clearly, to have his material well organized, to provide legible and comprehensible slides and to finish within his time limit. In return the speaker has a right to the audience's attention undisturbed by the distractions provided by the knitwits, the newspaper readers, and the private conversationalists.

[4] Typical examples of the questions and tasks assigned from both quizzes and library project will be furnished by the author on request.

with the instructor, a topic is selected for presentation by a panel of three students. One acts as moderator who introduces the subject and the speakers and who leads the discussion. Suitable topics for such seminars include: critical reviews of relevant books; the examination of the record in a patent case, a record that often points up the importance of precise language; a discussion of the laws of copyright; or a consideration of what is effective teaching. Material for these topics is readily available. The important feature is that the students, working in a group, organize and present material with a minimum of supervision from the instructor.

Source Material

Use of a text could defeat the aim of the course which is to stimulate self-help through use of the conventional tools of English — the handbook, dictionary, thesaurus. Any well written handbook is suitable, but I prefer one written from the point of view of descriptive rather than prescriptive grammar, e.g., Perrin's *Writers Guide and Index to English* or the *Prentice-Hall Handbook for Writers*. Reprints of articles of interest are placed in the departmental library where they are readily available to the students—the rule is to use them only in the library. Although reprints sometimes disappear, this system saves a lot of time for both student and instructor and encourages reading. Also, some material is mimeographed and supplied the student. The last two lectures in the course deal with sources with which the student may not be familiar, such as Fowler's *Modern English Usage*; stylebooks, Mencken's *American Language* and the like.[5]

Effectiveness

Whether the course improves the writing habits of many of the students is difficult to say since we do not have them long enough to judge. Ordinarily, one does not become a competent writer for several years even when he is trying—it is a difficult technique to acquire. The follow-up is necessarily in the hands of editors and directors of research who must constantly insist that the same high standards of performance be apparent in the writing of reports as in the laboratory research. The major improvement that we have noticed in thesis writing is that the candidates know what a technical style sheet is and how to use it. Their own style for the most part remains uneven and turgid, the usual signs of the inexperienced writer.

More positive results are observed in improving oral presentation. All the students have at least one more semester of seminar in the department, and most of them have several. They are also encouraged to give papers at local meetings of the Society of American Bacteriologists. In general, we have had reason to be pleased if not actually proud of their performance in these public demonstrations. At a minimum, they can recognize a poorly composed slide and will often hoot (in private, of course—see lecture on Audience Manners) at visiting lecturers who are careless in their slide-making. Perhaps more could be accomplished if the course were for a year rather than a semester and the enrollment were restricted to 12-15 students. But a university is called upon to provide all kinds of training, and writing is only one of the many accomplishments a graduate is supposed to possess.

[5] The books and papers listed are reference materials kept in the department library for the students' use. Copies of the list may be obtained from the AIBS office. The papers represent a typical sample of the more than 100 actually available as reprints. Among the most useful of these are the interesting contributions published in the Annual Book Issue of *Science*. The books by Quiller-Couch and by Rickard, unfortunately, are no longer in print, but many libraries will have copies.

The Gatlinburg Conference on Basic Problems of Biological Aging

H. BENTLEY GLASS, *Department of Biology, The Johns Hopkins University*

ON May 2-3, 1957, an AIBS Conference on Basic Problems of Biological Aging was held at Gatlinburg, Tennessee. The expenses of the conference and of the 44 invited participants, 4 of whom came from Europe, were defrayed by a grant from the National Science Foundation. The meeting was also attended by 9 observers and by the President and the Executive Director of the AIBS. In the restful atmosphere of the Great Smokies and with that desirable seclusion and comfort so necessary for undistracted and invigorating discussion, the members of the conference found ideal conditions for a profitable exploration of the biological processes of aging.

There are many approaches to the problems of aging, and few of them have been explored intensively from a basic biological, rather than a clinical, point of view. The botanist has a different viewpoint from the protozoologist, the zoologist working with invertebrate animals a different viewpoint from the zoologist concerned with vertebrate physiology. The biostatistician approaches the problem from the standpoint of a study of populations, the geneticist from that of a study of genetic types and the analysis of hybrids between them. The embryologist is concerned with the sequence of changes during aging, the physiologist with the acceleration or delay in aging brought about by nutrition, by radiation, or by temperature, in addition to other factors. The cytologist, histologist, and anatomist are respectively concerned with the progressive alterations detectible in cells, in tissues, and in organs. The cellular physiologist and the biochemist are more interested in the basic mechanisms whereby the changes come about. The limitations of each single point of view are obvious, and the conference was planned particularly to bring together workers from a wide variety of disciplines, with a common interest in the phenomena of aging, and to encourage through mutual education a more comprehensive consideration of its biological nature.

The current study of aging is characterized by a plethora of theories about its nature. Most of these have been based on rather scanty data from restricted groups of organisms and have been derived from a single approach to the problem. It was a particular concern of the conference to examine these theories from many points of view, in order to see whether there is indeed at the present time any sound body of evidence for the existence of a single, fundamental aging process among living organisms—or whether, on the contrary, the differences between plants and animals, between sexually reproducing and vegetatively reproducing forms, between invertebrates and vertebrates are such as to require fundamentally different bases for their aging processes. The presence among the participants of Geoffrey Bourne and Alex Comfort from London, F. Bourlière from Paris, and F. Verzar from Basel, added greatly to the scope of this consideration, because of their broad knowledge and critical capacity, so manifest in their books and other writings on the problem.

The organization of the conference was planned by the AIBS Committee on Basic Biological Aspects of Aging (Nathan Shock and Bernard Strehler, co-chairmen). It was decided to try the somewhat novel arrangement of having every participant submit his formal paper in brief form to be circulated to all others considerably in

advance of the meeting, and to limit the actual sessions to general discussion of topics, without formal presentation of any papers whatsoever. Most of the participants were able to circulate their papers in advance, as requested, and the transcript of the sessions is evidence that there was a lively, well-focussed discussion of each subdivision of the program. For this the respective chairmen are due great credit. The chief difficulty proved to be a lack of sufficient time within the two days to explore each of the aspects of aging to general satisfaction. The chief benefit derived from the conference was a recognition by everyone that his own outlook on problems of aging had been vastly extended through the presentation of quite unfamiliar data or points of view.

The sessions were arranged as follows:

First Day

I. The Assessment of Aging: General Introduction (Tracy Sonneborn, chmn.)
II. The Study of Mortality in Populations (Alex Comfort, chmn.)
III. Species Differences (W. J. Robbins, chmn.)
IV. Genetic and Developmental Aspects (James D. Ebert, chmn.)
V. Environmental Factors Affecting Aging: Nutrition, Radiation, Temperature (Maurice B. Visscher, chmn.)

Second Day

VI. Changes in the Structure of Cells, Tissues, and Organs (Geoffrey Bourne, chmn.)
VII. Cell Physiology in Relation to Aging (Norman G. Anderson, chmn.)
VIII. Biochemistry of Aging (Bernard Strehler, chmn.)
IX. Information Theory in Relation to Aging (Hubert P. Yockey, chmn.)
X. Theories of Aging (Bentley Glass. chmn.)

In the introductory session an effort was made to define the concept of aging and to answer the question, How is aging to be assessed, estimated, or measured? The variety of interpretations and points of view which at once became apparent made it clear that the conference would have to return to these major questions after a more detailed consideration of the data and concepts to be presented in the succeeding sessions. A question was also raised regarding the universality of aging, since the answer might be expected to bear on the problematical existence of a fundamental common basis or mechanism. Some persons thought a sharp distinction should be maintained between cellular aging and the aging of the individual, others that an equally sharp distinction exists between aging of the individual organism and aging of the clone or population. The relation of sexuality to aging was also introduced; and a necessary distinction between maturation and aging was emphasized by others. Is aging a disease process or a decline in performance, with numerous possible parameters? Is it impairment of some single vital capacity or is it a progressive decline in effective interaction and organization? From an ecological point of view, is it a decreasing ability to adapt to a particular environmental niche? Far more thought-provoking questions of these kinds were raised than could be answered immediately, and one point of view stressed that we must produce an acceptable theory of aging before attempting to define it.

The study of mortality in populations led to a brief exposition and consideration of the general applicability to different species of the Gompertz function. The principal questions of interest that were aroused by these considerations were, first, whether the generality of the Gompertz function indicates the existence of a common basis or mechanism; and second, what is signified by the existence of different slopes and points of origin for the portion of the life span fitting the Gompertz function.

The transition from a consideration of mortality in populations and the shapes of survivorship curves to a consideration of differences between species was natural and inevitable. W. J. Robbins and A. C. Leopold presented views about senescence in plants based on the occurrence of differences in senescence in different parts (organs) of a plant and in the entire plant, and on the possibility of reversing senescence by chemical agents, such as kinetin, indoleacetic acid, and tyrosine, which can make tobacco pith, for example, revert to a meristematic condition. Tracy Sonneborn referred to short-lived and long-lived strains of Paramecium adapted respectively to conditions of inbreeding and outbreeding. Differences in life span related to sex were pointed out as existing in plants as well as animals. Differences in life span in different breeds of the same species, such as dogs, imply the existence of genetic bases of aging (C. M. McCay). The effects upon the life span of hibernation appear in contrasts between hamsters and rats (McCay) and between bats and other mammals of similar size (F. Bourlière). A conclusion that the chief benefit of comparative studies is to enable us to distinguish between secondary and primary causes of aging met with general acceptance.

Discussion of genetic and developmental aspects of aging centered on two principal questions: (1) Are there changes within any molecular species during the course of differentiation and senescence? (2) Is aging a loss or restriction in potentiality? and further, are such losses themselves causal or are they effects of some more basic change? Discussion focussed on the aging of hemoglobin and of collagen, of antibody formation and elastin. But it was pointed out that more basic than such changes in proteins are alterations in nucleotide and coenzyme systems, and that little has yet been done to explore the relation of such changes as these to aging. Consideration of the second question raised the problem of regeneration. It was pointed out that in plants the capacity for regenerative growth always precedes senescence and death; that in mammals the rate of regeneration of liver tissue is equal in old and in young animals; that in hypertrophic kidneys there is an increase in the amount of DNA. Yet it may well be change in concentration rather than in absolute amount that is the essential parameter. It was therefore emphasized that we need far more, accurate studies of changes in the relative amounts and concentrations of significant substances than now exist.

Genetic theories of aging based on the occurrence and accumulation of somatic mutations were also considered. While there was strong support for the idea that over a life span of years enormous numbers of mutations must collect in somatic cells and must affect virtually every cell, and that this well might promote aging (G. Failla), quite a variety of evidence opposed to any simple theory of the sort was also set forth, e.g., possible offsetting of the accumulation of mutations in somatic cells by elimination of mutant cells and their replacement by non-mutant ones, or the endurance of their loss because of an initial over-supply; lack of aging effect of some potent mutagenic agents, such as nitrogen mustard; or lack of effect on the adult life span of the protraction of larval life in many invertebrate animals such as insects.

The effect of ionizing radiation in shortening the life span aroused an animated discussion. Recent data from the Oak Ridge experiments, indicating that the shortening of life in the progeny of irradiated males is equal to the shortening of life in the irradiated fathers themselves was presented, and led to a consideration whether radiation is a non-specific stress. It was pointed out that after a severe chemical stress, as with a toxin or antigen, there is no residual effect upon the life span, whereas with radiation as the agent there is one. Various extrapolations from mouse and rat, and data from irradiated persons, lead to the conclusion that 1 r (rad or rep) leads to a shortening of life ranging from 5 to 20 days. Nutritional and temperature effects on life shortening were also considered.

In the session on changes in structure of cells, tissues, and organs during aging, the necessity of distinguishing between normal senescent changes and alterations of a pathological kind at once became apparent. G. Bourne raised, for example, the problem of mitochondrial fragmentation with age—is it an adaptation to a decline in respiratory efficiency? What is the significance of the distinction that retardation of growth limits the occurrence of disease and degenerative effects in animals (McCay), but does not affect the normal aging of bone, skin, eye, etc.? The value of using parabiotic animals in studies of such nature was stressed. Another aspect which was emphasized (J. Gross) was the effect of alterations in the properties of molecules by modifications of states of aggregation (fibrillar, micellar) such as can be produced quite simply in vitro by simple

physical or chemical agents. The increase of the amount of DNA per cell through an increased frequency of polyploid nuclei in the course of aging in organs was also thought to be of possible causal significance (C. H. Barrows).

In the session on cellular physiology and aging, the increase with age in the cross-linkages of filamentous proteins such as collagen and nerve (Verzar), the accumulation of mitochondria and abundance of cytochrome oxidase per mitochondrion (H. Herrmann) were brought out. The endoplasmic reticulum appears in the cytoplasm and develops. Cellular proteins in solution aggregate (N. G. Anderson). Unstructured cytoplasm becomes more structured.

In the session on the biochemistry of aging the chairman presented a challenging outline for discussion centered around the questions: Is it possible to rule out one or the other of certain alternative views on the basis of the present evidence? What is the nature of that evidence? What experiments are most likely to lead to a decision between alternative possibilities? Are the structures involved in age changes, whether accidental or inherent, resident primarily in molecules (nucleic acids and proteins—F. M. Sinex) or in supramolecular structures such as microsomes, membranes, mitochondria, or chromosomes? Are the biochemical changes primarily alterations of arrangement (order-disorder) or of concentration (mass-action)? Are they chiefly intracellular or extracellular?—and numerous others. The debate was lively.

Information theory is a newly developing field about which most biologists are quite ignorant. An enlargement in point of view followed consideration of the analogy between "probabilistic automata" and living organisms (M. Eden) and the introduction of "noise" into the transmittal of the coded genetic information, through radiation and other deleterious agents (H. P. Yockey).

The final survey of theories of aging took a look at the evolution of senescence. In addition to its primary evolutionary aspect, the advantage of eliminating decadent individuals from a population, secondary causes for the evolution of senescence were found to lie in the genetic adaptation of the life span to the mating pattern (Sonneborn; Glass) or to derive from the pleiotropic effects of genes that are advantageous in youth but deleterious in older individuals (G. C. Williams). Some theories of aging assume a universal mechanism, others multiple and variable causes. Some universalists seemed to base their conviction on the universality of the evolutionary pressures. Others sought a unitary mechanism, whether the failure of information transfer, the accumulation of somatic mutations, the breakdown of molecular constitution, the accumulation of toxic substances such as enzyme inhibitors, or the increasing probability of disease. Of the adherents of multiplicity theories, some thought it was a question of the durability of the weakest link, such as deterioration of collagen, endocrine or vascular degeneration of the nervous system, or loss of regulatory capacity. Others preferred the concept of the fixed life-span, of a biological clock set fatefully by the accumulation of insult, the rate of living (wear-and-tear), or the inevitable continuation of morphogenesis and differentiation to the ultimate fate of structural rigidification. No agreement being possible at this time, in the lack of crucial evidence, all participants departed with enthusiasm for the next stage of development in the field, the more critical experimental testing of sharpened hypotheses.

Certain definite actions were taken by the conference. It was voted that the appropriate agencies should be urged to support a summer course at some convenient center, in order to stimulate younger students to study aging and to provide an extended opportunity for workers on these problems to exchange their views more fully. It was also felt that there should be a national fellowship program to encourage the recruitment of biologists in this field. Another resolution called for the establishment of a center where aged animals might be reared and maintained under standard conditions as a source of supply to workers in the field. At present it is very difficult, without years of delay, for a biologist in this field to provide his material. The great need for a wider and better organized collection of data for life tables of species was stressed. Additional conferences or panel discussions to deal with specific areas and problems within the larger field of aging should be arranged to follow up the profitable suggestions arising from the present conference.

To conclude, the Conference on the Biological Basis of Aging has answered no puzzling questions. Yet obviously all the participants have profited greatly and have returned to their own work with renewed zest and a deepened understanding of many aspects of aging previously beyond their ken.

Criteria for Preparation and Selection of Science Textbooks

Subcommittee on Instructional Materials and Publications, Committee on Educational Policies, Division of Biology and Agriculture, National Academy of Sciences-National Research Council.[1,2]

THAT textbooks are often less than adequate is one of the commonest complaints of teaching biologists. In courses on which the professor is himself expert, and in which his students can use research literature and monographic reviews, the shortcomings of textbooks are of little concern. But the majority of courses do rely on textbooks. The importance of their being as good as possible cannot be over-emphasized.

One of the first assignments given the Subcommittee on Instructional Materials and Publications of the Committee on Educational Policies was to consider what can be done to improve textbooks. To this problem the Subcommittee has proposed three main approaches, all of which have been endorsed by the parent committee. One is to foster searching reappraisals of the content and organization of courses by inviting panels or symposia of leaders in a field to focus upon teaching the kind of cooperative assessment that goes into symposia and conferences on research developments. The second is to emphasize that writing a first-rate textbook can be a major contribution to the advancement of the science, and that competent biologists should therefore have access to well-paid fellowships which free them from other obligations for periods long enough to author scholarly and stimulating textbooks. The third point—with which this article is mainly concerned—is that standards can ultimately and properly be set only by those who buy the books.

[1] John A. Behnke (The Ronald Press Company), *Chairman;* Hiden T. Cox (American Institute of Biological Sciences); Chester A. Lawson (Michigan State University); Alfred S. Romer (Harvard University).

[2] The Subcommittee takes pleasure in acknowledging the assistance of a former member, Richard T. Wareham (D. C. Heath & Co.), in preparing this statement.

It has been suggested from time to time that some organization be set up as a sort of national board of review for textbooks. The Committee on Educational Policies believes that this notion is both unrealistic and potentially dangerous. However distinguished the reviewing group, individual professors will and should make their own choices. Moreover, the creation of any such group raises the menace implicit in any action that tends to standardize ideas—the threat of imposing a straight-jacket upon the intellectual life, where vitality demands freedom, and the only proper discipline is self-discipline. The burden therefore falls upon those who select texts. Selectors in the past have simply not applied sufficiently demanding criteria. If they did so, "economic sanctions" would require that authors and publishers meet higher standards.

We therefore offer the following point of view and set of criteria as an aid to those who must select books that will best serve the instructional purposes of a given course. The point of view and criteria are considered to be equally applicable to the preparation and selection of textbooks for high school, college and graduate instruction in any of the sciences.

Point of View

Some statistical evidence and much general observation lead to the conclusion that high school and college courses in science do not yield a higher percentage of students with scientific attitudes toward problems than do non-science courses. If this is indeed true, the cause must be sought in teaching, unless one is willing to believe that students of high school and college age have already become so inflexible as to be unable to acquire characteristics usually described as scientific attitudes—healthy skepticism, open-mindness, willingness to apply new data to problems considered settled. It is conceivable that some students at this stage may have lost their malleability. Science teaching, however, must be predicated on the assumption that most have not.

Upon looking back on their own schooling, most scientists can remember how instructors and textbooks sometimes failed to exemplify scientific attitudes. Science teaching and science textbooks, especially at elementary levels, are too often authoritarian—the very antithesis of scientific attitudes and modes of thought. Many books present theory and fact as though there were no difference between them and as though both were settled for all time. In contrast, the best books and the best teaching show clearly that science is a search for knowledge and that mankind is very far from the end of the search in any branch of science; they inspire both a love of learning and a zeal for the quest.

We believe that *authoritarian teaching* of science as found in many textbooks does much to close minds, not open them; to make robots, not thinkers; to discourage, not encourage further work in science; to inhibit, not promote attempts to apply scientific methods to the numerous problems one meets daily in every walk of life.

In many courses and textbooks, subjects are presented as though the course or textbook contained *all* the available facts and theory on the subject at hand, when, in fact, no book or course can present more than a *selection* of fact and theory. Capable students are unlikely to choose a field for a career if it is shown to them as an apparently closed and completed story.

We believe, therefore, that all science textbooks should exhibit the following basic characteristics:

1) They should show the difference between fact and theory, between the solid core of verified knowledge and on-going intellectual exploration, between reaffirmed theory and the continuing re-evaluation of interpretations. If students are frequently reminded that what they are reading is the *present state of knowledge* or *the present interpretation of observations and experimental results*, they will be more likely to think of science as a *process*, as well as a more or less organized body of observations and explanatory theories. Truth in science is continuously being sought and is continuously changing as new observations are made and new theories are evolved to explain them. *The aim of science teaching is to show the nature of science as well as the science of an aspect of nature.*

2) They should make it very clear that the course is a *selection* of presently-known facts and more or less accepted theory. Occasional or frequent reminders that portions (sentences to chapters) could be expanded into whole books or shelves of books can help to increase the reader's appreciation of the scope of the subject presented.

3) They should *cite unsolved problems*. Frequently the development of a topic offers golden opportunities for showing gaps in current information or theory. Appreciation of the need for research can be fostered by discussing problems now under investigation or in need of investigation.

4) They should show the *relationships* of the given subject to other fields of science and to broad problems of humanity. Student interest can be quickened by the occasional, if not frequent, consideration of what a fact or theory is *good for*. How often are students shown the range of impact of scientific fact and theory on intellectual history and human affairs?

Criteria

Content

1) *Adequacy of coverage.* Books are often criticized for inadequacy of material by those who have not judged the product in relation to the purpose for which the book was written. Furthermore, users too often seem to want—with consequent pressure on authors and publishers—a storehouse of factual information rather than a well-ordered synthesis of basic concepts and principles. No text today can be complete; and even if a "complete" book were possible, it would be undesirable because it would tend to preclude other reading representing different viewpoints and interpretations. It follows, therefore, that a teacher who discards a good book for a poor one on the basis of the omission of some relatively unimportant topic (often one the user could best supply) does his students an injustice.

2) *Up-to-dateness.* The science text selected should represent the most modern thinking available, articulated with the cumulative store of relevant concepts from the past. This criterion is often distorted by merely superimposing a seductive facade of recent research results and references upon a fundamental framework that should have long since gone into the discard. Successive editions of a text should particularly be scrutinized to determine whether the framework or only the facade has been "brought up to date."

3) *Point of view.* Does the book present, as advocated above, scientific methodology, the scientific process (and throughout, not merely in a lip-service chapter)? And does it open some of the vast vistas of unanswered questions that make up the challenge of the future?

4) *Suitability for students.* Too often the teacher selecting a text judges in terms of its impression on him, without sufficiently considering its suitability for students at the level of development represented in his course. Authors, too, have been known to write books more for colleagues than for students. The selector should ask himself such questions as the following: Does the book require background his students have not yet acquired through courses or from general experience or concurrent reading? Is the amount of terminology within the student's grasp? Are new terms properly defined and intelligently used? (Fortunately, biology seems gradually to be discarding the idea that even elementary courses must be terminology memory-mills.) It has long been known that if terms are to be remembered and available, they must be meaningful, must be useful, and must be used. At the same time, we certainly do not mean that there should be no "stretching" of the student, even the average student, with new words or mature language. If at each grade level we assumed that the student could not handle languages he had not been exposed to before, when would the student advance beyond the primers?

5) *Logical coherence.* A textbook should build from simple to complex in proper steps; topics should be developed in a logical sequence, not as an assemblage of facts arranged by categories. Rarely if ever is there only one "right" outline, but the author should be able to show a reasoned basis for the organization he has adopted, and the user should be able to see the organizational plan without excessive effort or persuasion. The requirement of a logical sequence does not preclude repetition of the same material in different contexts; a discipline may have more than

one dimension. On the other hand, a text fails to achieve its proper function if it is so loosely structured as to be amenable to random recombination of its parts.

6) *Accuracy.* Author and publisher should have done everything possible to insure accuracy. Carping criticism of minor obvious errors would seem unjustified, but many small slips should alert the selector to the possibility of more basic faults. Most serious are uncritical acceptance of interpretations, dogmatism, and errors in important factual content.

7) *Summaries.* For some types of textbooks, end-of-chapter summaries can be valuable teaching aids. An alternative method is to use marginal notes summarizing each section or paragraph and so phrased as to form a chapter summary when read consecutively. In no case should summaries offer an escape from reading the chapter, but they can usefully highlight the main points. Summaries at the ends of chapters can also be used to develop transitions between chapters or to point up unsolved problems and questions.

8) *Study questions.* These are not necessarily essential but can be valuable if they do not merely trigger regurgitation. The temptation to use rote questions will be less if the development of the subject is more than merely factual. Questions should be graded in difficulty and should offer students real challenges by requiring a search for answers outside the textbook, by posing problems not adumbrated in the text, and by inclusion of optional questions for students with the inclination and aptitude to penetrate the subject more deeply.

9) *Bibliographies.* In elementary texts extensive reference lists, particularly to material far beyond the comprehension of the student, are relatively useless. Furthermore, if the book is to find general use, the references must be readily accessible sources. In more advanced texts more comprehensive reference lists can be very valuable, but there, too, all citations should be scrutinized for pertinence. A reference list is more helpful if it includes "capsule" annotations, especially to show what part of a reference is pertinent and what light it throws on some topic in the chapter.

10) *Indexes.* Textbook indexes are frequently so incomplete or so poorly designed as to be doubtfully worth the extra pages. The main purpose of an index is to enable a reader to find topics, and especially major discussions of topics, under words the reader is likely to look for. A good index is comprehensive and is built around ideas and concepts as well as around names of things. Identifying major discussions by such devices as boldface page citations increases the index's usefulness.

Form

1) *Clarity and readability.* No matter how good the material, it might as well remain locked in the author's mind if he fails to transmit it with crystal clarity. If to clarity the author can add fluency, verve, apt analogy, even a sprinkling of humor, the student will not only read with pleasure but will grasp and retain more of what he reads. Texts with these qualities are rare in the second-hand market, since even a textbook with these attributes often becomes a permanent addition to the student's library. But style is not all. There have also been texts that read like novels but lacked real substance and lost their appeal upon more mature reflection.

2) *Illustrations.* Illustrations can be invaluable teaching aids, merely decorative, or both. Ideally they should be both instructive and pictorially effective. If merely decorative, their worth is highly dubious. To be instructive they should be so completely integrated with the text that the text is relatively unintelligible without them and the illustrations relatively meaningless without the accompanying exposition. This implies that illustrations should be as near the appropriate textual material as possible. We also deplore the long-standing practice of uncritically borrowing illustrations from other sources, irrespective of their accuracy or appropriateness. Poor composition and reproduction can similarly vitiate the effectiveness of illustrations. Authors are often tempted to include so much in a single figure as to confuse or discourage the reader. Photographs, particularly photomicrographs, lose much of their effect if reproduction is of less than superior quality.

3) *Aids to emphasis.* Judicious use of headings, boldface, and italics can assist the student by highlighting conceptual relations and important definitions and terms. But when overdone, the effectiveness of such devices diminishes rapidly.

4) *Format.* Attractive typography and binding can help make the use of a book a pleasurable experience, but a selection based primarily on these elements is certainly unwise.

Suggested Procedures for Selecting a Text

Using these criteria, how does the conscientious teacher set about selecting a suitable text for a given course? Obviously, the thoroughness of his search and the time required will depend on the number of books available and his familiarity with the older ones, and on his own involvement in the subject. If the field is his major interest, selection will be simplified, and he may skip some of the steps listed. If it isn't, and he has the interests of students fully in mind, he will do well to exercise the utmost care.

1) Scanning the available books may be adequate for a rough screening, but those under serious consideration should be read.

2) The selector should watch for *critical* reviews which, presumably, are written by experts. However, he himself should apply as much critical judgment as possible to the reviews, for they may be biased or wrong.

3) If the book includes any substantial amount of relatively unfamiliar material, expert critical advice should be sought.

4) It may be desirable, especially at introductory levels, to try selected chapters on students who seem to possess critical capacities but have not progressed so far as to be unable to judge comprehensibility and readability for those who will be using the text.

5) Before he makes his choice, the selector should carefully compare the available books, matching them point by point against a set of such definite and explicit criteria as those herein outlined.

Biological Programs at AAAS Indianapolis Meeting

DECEMBER 26-30, 1957

THE 124th meeting of the American Association for the Advancement of Science in Indianapolis will include some 300 sessions of the 18 AAAS sections and 70 participating organizations. Programs of particular interest to biologists follow.

AAAS General Symposium

The Committee on AAAS Meetings has established the policy that each annual meeting of the Association will emphasize programs important to science as a whole. The year's program, "Moving Frontiers of Science, II: Ideas That Mold Our Lives," concerns relativity, organic evolution, and human behavior. Chairman, F. S. C. Northrop; Synthesizer, J. Robert Oppenheimer; Speakers, H. P. Robertson, Th. Dobzhansky, S. S. Stevens; Panelists, G. C.

McVittie, Paul B. Sears, Rensis Likert. Dec. 26, even. and Dec. 27, p.m.

Sections F and G—Biological Sciences

The following symposia, cosponsored in part by the American Society of Naturalists, American Society of Plant Physiologists, American Society of Zoologists, Botanical Society of America, Ecological Society of America, and the Society of General Physiologists.

"The Importance of Population Studies in Ecology," arranged by M. Trufant Hall, Dec. 27, a.m.

"Recent Advances in Understanding of Pituitary Function," Speakers: Paul A. Wright, W. R. Breneman, A. A. Nalbandov, Dec. 27, even.

"Polarity, Heads or Tails," arranged by A. C. Leopold, Dec. 28, a.m.

"Geographic Distribution of Contemporary Organisms," Dec. 29, a.m. Speakers: Paul S. Martin, Aaron J. Sharp, H. H. Ross, W. Frank Blair, Kenneth C. Parks, E. L. Cockrum. Arranged by H. H. Plough.

"Some Unsolved Problems of Biology, II," arranged by Barry Commoner, Speakers: Hans Gaffron, S. Meryl Rose, Felix Haurowitz, Robert W. Briggs. Dec. 29, a.m.

"Low Level Radiation" (Radiation Biology). Speakers: Robert A. Dudley, Lester Machta, Earl Green, Austin M. Brues, David E. Price, Carl E. Lindstrom, the Hon. Chit Holifield. Dec. 30, a.m. and p.m.

Botanists' Dinner and Vice Presidential address of Section G by Harry J. Fuller, Dec. 29, even.

Zoologists' Dinner and Vice Presidential address of Section F by E. Raymond Hall, "Conservation and the Animal Ecologist," joint with the Society of Systematic Zoology, Dec. 29, even.

Sessions for contributed papers in principal fields of botany and zoology, Dec. 26-30.

American Physiological Society

Symposium, "Physiological Problems Involved in Space Travel" with Major David Simons et al., arranged by Fred A. Hitchcock, Dec. 29, a.m.

Beta Beta Beta Biological Society

Biennial national meeting and luncheon, Dec. 27.

Biometric Society, ENAR

Address by R. A. Fisher "Smoking and Lung Cancer: An Example of the Interpretation of Statistical Data in the Observational Sciences," Dec. 27, a.m.

Sessions for contributed papers, some joint with American Statistical Association, Dec. 28-30.

Ecological Society of America

Seven sessions for contributed papers in plant and animal ecology, Dec. 27-29.

National Association of Biology Teachers

Annual national meeting, Dec. 26-30 inclusive.

Sigma Delta Epsilon

Annual national meeting Dec. 26-28; Harry J. Fuller, luncheon speaker.

Society for Industrial Microbiology, Washington (D. C.) Section

Symposium, "Some Areas in Industrial Microbiology," arranged by Walter N. Ezekiel; sessions for contributed papers.

Society of Systematic Zoology

Annual national meeting, Dec. 27-30.

United Chapters of Phi Beta Kappa

18th annual address, by Elvin C. Stakman, "A Long Search for Understanding."

Section N—Medical Sciences

Four-session symposium, "The Human Integument—Normal and Abnormal," cosponsored by the American Medical Association Committee on Cosmetics and the Society for Investigative Dermatology, arranged by Stephen Rothman, Dec. 28, 29, a.m. and p.m.

Section O—Agriculture

Four-session symposium, "Biological and Chemical Control of Plant and Animal Pests," arranged by Louis P. Teitz, Dec. 28, 29, a.m. and p.m. Sessions for contributed papers.

General Events

AAAS Presidential Address by Paul B. Sears. Reception, Dec. 28, even.

AAAS Smoker for all registrants. Dec. 29, even.

AAAS Annual Exposition of Science and Industry (100 booths). Dec. 27-30.

AAAS Science Theatre, Dec. 27-30.

Coupons for sleeping accommodations and for advance registrations will be found in *Science* and *The Scientific Monthly*.

1957 AIBS Governing Board Report

The 1957 Annual Meeting of the AIBS Governing Board was held at Stanford University, California, August 24th. The following is a very brief summary of the major actions that are of interest to the membership of AIBS:

(1) As a result of the AIBS Editors Conference a proposal was made that the AIBS investigate the possibility of establishing a joint editorial-business managerial office for a group of biological journals. The Governing Board accepted this proposal and directed that an investigation of the cost of establishing such an office and an estimate of the savings that might accrue to the various journals be made. It was further passed that a conference of journal editors, who are directly interested in such an arrangement, be called during the winter of 1958. It was stipulated that each society interested in sending its editor be requested to pay up to half of the expenses for travel of the editor. The AIBS would pay the remaining expenses.

(2) The Governing Board approved a recommendation of the Executive Committee that the Subcommittee of Review Articles and Books of the Publications Committee undertake a study of those Russian language monographs in various fields of biology which would be worthwhile to have translated.

(3) The Governing Board accepted the invitations of the following institutions for future annual meeting sites:

1959—Pennsylvania State University
1960—Oklahoma State University
1963—University of Massachusetts

(4) The Governing Board moved that a second annual meeting of the Governing Board be held in 1958 in the spring on an experimental basis. This move resulted from a recommendation of the Executive Committee and the Executive Director. It was felt that the Governing Board could play a more effective role in guiding the overall policy of the Institute if a meeting could be held at a time other than during the annual meetings. It was proposed that a spring meeting of two days duration be held away from a metropolitan center.

(5) The Governing Board passed a motion that a committee be appointed to continually study and review the constitution and by-laws of the AIBS.

(6) Applications for Full Membership in the AIBS from the American Society of Human Genetics and the Conference of Biological Editors were accepted by unanimous vote.

(7) Officers elected for 1958 are as follows:

President: Wallace O. Fenn
Vice President: Paul Kramer
Secretary-Treasurer: F. P. Cullinan
New member of the Executive Committee to serve until January 1, 1962, Arnold Grobman

1958 PROPOSED BUDGET AS APPROVED BY THE GOVERNING BOARD

A. INCOME			
Society Dues			$ 15,759.00
Affiliate Dues			1,600.00
Associate Contributions			4,350.00
Individual Members (Exclusive of Life Members)			700.00
Business Services			2,400.00
Convention:			
Registration Fees		$13,500.00	
Exhibit Hall		8,000.00	
Program Advertising		3,500.00	25,000.00
Interest on Savings Deposits			700.00
Contract Overhead:			
ONR Advisory Committees		$10,000.00	
NSF Register		3,913.000	
NSF Advisory Committee		2,906.00	
NSF Lecturers Bureau		3,261.00	
NSF Translation Grant		7,826.00	
NSF Ad Hoc Translation Grant		457.00	
NSF Zoologists Grant		717.00	
AEC Management Service Contract		3,130.00	
AEC Visiting Lecturers		653.00	
CIA Services Contract		378.00	33,241.00
Contract Services Committed:			
ONR Advisory Committees		$40,000.00	
NSF Register		26,087.00	
NSF Advisory Committee		17,094.00	
NSF Lecturers Bureau		21,739.00	
NSF Translation Grant		52,174.00	
NSF Ad Hoc Translation Grant		3,043.00	
NSF Zoologists Grant		4,783.00	
AEC Management Service Contract		20,870.00	
AEC Visiting Lecturers		4,347.00	
CIA Services Contract		2,522.00	$192,659.00
Publications:			
Bulletin (Exclusive of Program Issue):			
Subscriptions and Miscellaneous		$ 700.00	
Advertising		8,000.00	8,700.00
Symposium Series		$ 4,000.00	
Quarterly Review	$13,000.00		
Quarterly Review Advertising	250.00	$13,250.00	$ 17,250.00
Placement Service			600.00
TOTAL INCOME			$302,989.00
B. EXPENDITURES			
Salaries:			
AIBS	$34,658.00		
ONR Advisory Committee	10,610.00		
NSF Register	17,900.00		
NSF Lecturers Bureau	4,290.00		
Translation Grant	2,312.00		
AEC Management Services	3,750.00	$73,520.00	
Justifiable Salary Increases:			
AIBS	$ 857.00		
ONR Advisory Committee	162.00		
NSF Register	405.00		
NSF Lecturers Bureau	90.00		
Translation Grant	45.00		
AEC Management Service	81.00	$ 1,640.00	$ 75,160.00

Rent		7,920.00
Telephone, Postage, Supplies		3,500.00
Business Services		3,000.00
Printing		1,000.00
Depreciation		700.00
Miscellaneous		1,000.00
Special Services:		
Insurance	$ 550.00	
Social Security:		
AIBS	799.00	
ONR Advisory Committee	242.00	
NSF Register	411.00	
NSF Lecturers Bureau	98.00	
Translation Grant	53.00	
AEC Management Service	86.00	
Retirement:		
AIBS	$ 1,091.00	
ONR Advisory Committee	347.00	
NSF Register	171.00	
AEC Management Service	126.00	
Auditor	1,500.00	
Attorney	1,200.00	$ 6,674.00
Scientific Manpower Commission		150.00
Convention:		
Travel	$ 2,000.00	
General Expenses	7,000.00	
Program Issue	7,000.00	$ 16,000.00
Travel (Officers, Board, Staff)		6,000.00
Contract Services Committed:		
ONR Advisory Committees	$28,639.00	
NSF Register	7,200.00	
NSF Advisory Committee	17,094.00	
NSF Lecturers Bureau	17,261.00	
NSF Translation Grant	49,764.00	
NSF Ad Hoc Translation Grant	3,043.00	
NSF Zoologists Grant	4,783.00	
AEC Management Service Contract	16,827.00	
AEC Visiting Lecturers	4,347.00	
CIA Services Contract	2,522.00	$151,480.00
Publications:		
Bulletin	14,000.00	
Symposium Series	$ 1,000.00	
Quarterly Review	12,000.00	$ 27,000.00
Placement Service		700.00
Surplus		2,705.00
TOTAL EXPENDITURES		$302,989.00

THE QUARTERLY REVIEW OF BIOLOGY

Editor: B. H. WILLIER
Associate Editor: H. BENTLEY GLASS
Assistant Editor: CARL P. SWANSON

The Quarterly Review of Biology is now owned and published by the American Institute of Biological Sciences
Subscription rates $7.50 per year
To members of AIBS Member Societies and Individual Members of the Institute: $6.50 per year

Address all inquiries and subscriptions to:
AMERICAN INSTITUTE OF BIOLOGICAL SCIENCES
2000 P Street, N.W., Washington 6, D. C.

A.I.B.S. Symposium Proceedings Series

Molecular Structure and Functional Activity of Nerve Cells

Edited by R. G. GRENELL *and* L. J. MULLINS

Published January 1957 — $4.75 ($3.75 AIBS)

Molecular Structure and Biological Specificity

Edited by LINUS PAULING *and* H. A. ITANO

Published October 1957 — $4.75 ($3.75 AIBS)

Ultrasound in Biology and Medicine

Edited by E. KELLY

Published October 1957 — $4.75 ($3.75 AIBS)

Coming in December

Spores

Edited by H. O. HALVORSON

$4.75 — $3.75 (AIBS Members)

Orders and all inquiries should be directed to:

AMERICAN INSTITUTE OF BIOLOGICAL SCIENCES

2000 P St., N.W. — Washington 6, D. C.

Across the Editor's Desk

• **The Atomic Energy Commission has established a program of financial assistance to colleges and universities** to encourage the study of radiobiology, and the use of radioisotopes in courses in the life sciences.

The program is an extension of the Commission's present activities to stimulate education and training in the application of nuclear technology to the life sciences. Under the new program, the Commission will make financial grants toward the cost of acquisition of specialized radiation equipment and teaching aids. The grants will be made to accredited schools of agriculture, veterinary medicine, medicine and pharmacy, public health, and departments of biophysics and biology in colleges and universities.

Applicants must be non-profit institutions with faculties qualified to conduct the proposed courses, and must propose educational programs related to nuclear technology as applied to the life sciences. In determining whether to provide assistance, the Commission will consider the scope and objectives of the proposed program, the educational level of the program in existing or proposed curricula, and the estimated number of students to be served.

Assistance will be provided for the purchase of radioisotopes and specialized equipment, including radiation detection, monitoring and counting instruments, equipment for laboratory instruction in the analytical chemistry of radioactive materials of direct application in the life sciences, and equipment for laboratory instruction in health physics. Grants may not exceed $250,000 for any single institution.

Previously announced Commission programs of assistance for education and training in the life sciences and health physics include on-the-job training in Commission laboratories; special training programs in the use of radioactive materials at the Oak Ridge Institute of Nuclear Studies; special fellowships in radiological physics, industrial hygiene and industrial medicine; radiobiology training for high school science teachers and a radiobiology lecture series in colleges and universities conducted by scientists from Commission laboratories.

Further information on the new program may be obtained from the Director, Division of Biology and Medicine, U. S. Atomic Energy Commission, Washington 25, D. C., to whom proposals should be addressed.

• **The Division of Biological and Medical Sciences of the National Science Foundation announces that the next closing date for receipt of research proposals in the life sciences is January 15, 1958.** Proposals received prior to that date will be reviewed at the Winter meetings of the Foundation's Advisory panels and disposition will be made approximately four months following the closing date. Proposals received after the January 15, 1958 closing date will be reviewed following the Spring closing date of May 15, 1958.

In addition to funds for the support of basic research in the life sciences, limited funds will be available during the current fiscal year for the support of research facilities and programs at biological field stations.

Inquiries should be addressed to National Science Foundation, Washington 25, D. C.

• **The National Science Foundation has announced 462 grants totaling $6,190,601** awarded during the quarter ending July 31, 1957, for the support of basic research in the sciences, for conferences in support of science, for short term research by medical science students, for exchange of scientific information, and for training of science teachers.

• **The National Science Foundation has announced that applications will be accepted in four NSF fellowship programs for advanced study in research in the natural sciences.** The four fellowships programs are: (1) a predoctoral fellowship program for which college seniors and graduate science students may apply; (2) a postdoctoral fellowship program for scientists who have already received the doctoral degree; (3) a senior post-doctoral fellowship program for candidates who have held a science doctorate for a minimum of five years; and (4) a science faculty fellowship program for college teachers of science who wish to improve their competence as teachers. Fellows will be selected on the basis of ability, as evidenced by letters of recommendation, academic records and other evidence of attainment. Applications for the pre-doctoral fellowships are required to take the graduate record examination. Candidates' qualification will be evaluated by carefully chosen panels of scientists established by the National Academy of Sciences-National Research Council and the Association of American Colleges. Stipends for the NSF Fellowships vary with the academic status of the fellows. First year fellows, that is students entering graduate school for the first time or those who have had less than one year of graduate study, will receive annual stipends of $1600. Fellows who need one final academic year for training for doctorate degrees will receive annual stipends of $2000. Fellows between these groups will receive stipends of $1800 annually. The stipends for regular post-doctoral fellows will be $3800 per year. Dependency allowances will be made to all married fellows. Tuition and laboratory fees and limited travel allowances will also be provided. Senior post-doctoral fellows and science faculty fellows are awarded stipends adjusted to match as closely as possible the regular salaries of the award recipients up to a maximum of $10,000. per year. A travel allowance is also usually made available.

NSF fellows may attend any accredited non-profit institution of higher education in the United States or similar institution abroad. Applications for the 1958-59 NSF graduate or post-doctoral fellowship program may be obtained from: Fellowship Office, National Academy of Sciences-National Research Council, 2101 Constitution Avenue, N.W., Washington 25, D. C.

The closing dates for receipt of applications are: December 23, 1957, for post-doctoral applications; and January 3, 1958, for graduate students working towards advanced degrees. Selections will be announced on March 15, 1958.

Applications for the senior post-doctoral and the science faculty fellowships may be obtained from the Division of Scientific Personnel and Education, National Science Foundation, Washington 25, D. C. Completed material must be received not later than January 13, 1958. Selections will be announced March 18-20, 1958. Approximately 850 graduate and 85 regular post-doctoral fellowships will be available during the 1958-59 academic year.

• **The National Academy of Sciences-National Research Council has announced that the program of Postdoctoral Resident Research Associateships again will be offered for 1958-59 by the Argonne National Laboratory, The National Bureau of Standards, the Naval Research Laboratory, and the Oak Ridge National Laboratory.** These Associateships have been established to provide young scientists of unusual ability and promise an opportunity for advanced training in basic research in a variety of fields. Applicants must be citizens of the United States. They also must produce evidence of training in one of the listed fields, equivalent to that represented by the Ph.D. or Sc.D. degree and must have demonstrated superior ability for creative research. Remuneration for these Associateships is $7,035 a year.

Application materials may be secured by writing to the Fellowship Office, National Academy of Sciences-National Research Council, 2101 Constitution Avenue, Washington 25, D. C. In order to be considered for awards for 1958-59 applications must be filed at the Fellowship Office on or before January 13, 1958. Awards will be announced about April 1, 1958, by the participating laboratories.

The Argonne National Laboratory has listed the following biological subjects in which investigation may be carried out under the associateship program: "biochemistry, cancer research, cytology, experimental pathology, genetics, animal physiology, plant physiology, plant radiobiology, statistics, and mathematical biology." At the Oak Ridge National Laboratory, under Health-Physics the following fields are listed: "dosimetry, ecology, ground dis-

posal of radioactive waste, information theory and the physics of tissue damage, permissible dose of radiation to humans, studies of the attraction of radiation and matter."

• **The National Science Foundation, the American Society of Biological Chemists, and the Division of Biological Chemistry of the American Chemical Society are cooperating to support the travel of a limited number of American scientists to the 4th International Congress of Biochemistry,** to be held in Vienna, Austria, September 1-7, 1958. The closing date for the receipt of applications is February 1, 1958. Application blanks are available from the National Science Foundation, Washington 25, D. C., and completed forms should be returned to the Foundation. Because of the limited amount of funds available, the size of each grant will be sufficient to defray only a part of the travel costs incurred in attending the Congress. An attempt will be made to have the awards approximate air-coach fare from the scientist's home institutions to Vienna and return. As in the past, a portion of the funds will be used to support the travel of qualified younger investigators who have not had the opportunity to attend an international congress.

• **The National Science Foundation, the American Institute of Biological Sciences and interested microbiological societies are cooperating to support the travel of a limited number of American scientists to the 7th International Congress of Microbiology,** to be held August 4-9, 1958 in Stockholm, Sweden. Application blanks are available from the AIBS, 2000 P St., N.W., Washington 25, D. C., and completed forms must be returned to the AIBS no later than January 1, 1958. Any active microbiologist in this country, regardless of his society affiliations, is eligible.

• **The National Science Foundation, the American Institute of Biological Sciences and the American Society of Zoologists are cooperating to support the travel of a limited number of American scientists to the XVth International Congress of Zoology** to be held in London, England, July 16-23, 1958. Grants will not normally exceed $500. Application blanks are available from the AIBS and completed forms must be returned to the AIBS office no later than January 1st, 1958. Any active zoologist in this country, regardless of his society affiliation, is eligible to apply.

The XVth International Congress of Zoology is under the Presidency of Sir Gavin de Beer, Director of the British Museum (Natural History), assisted by an advisory committee of leading British zoologists. 1958 is both the centenary of the reading of the Darwin-Wallace paper propounding evolution by natural selection and the bicentenary of the issue of the 10th edition of Linne's Systema Naturae. To mark these, a number of special topics and sessions are being arranged which will center around evolution. The Congress will be organized into 12 Sections: General Zoology, Genetics and Taxonomy, Marine Zoology, Invertebrate Zoology, Vertebrate Zoology, Comparative Physiology, Embryology, Parasitology, Cytology, Ecology, Animal Behavior, Zoologic Nomenclature. The congress will be preceded by a Colloquium on Zoologic Nomenclature (July 9-15th). For detailed information and membership registration letters should be addressed to: The Registrar, XVth International Congress of Zoology, c/o The British Museum (Natural History), South Kensington, London, S.W. 7, England. Titles and abstracts of papers to be presented in person will have to reach the same office before January 1st, 1958.

• **The IXth International Botanical Congress** will be held in Montreal, Canada, from August 19-29, 1959, at McGill University and the University of Montreal. The program will include papers and symposia related to all branches of pure and applied botany. A first circular giving information on programs accommodation, excursions, and other detail will be available early in 1958. This circular and subsequent circulars including application forms will be sent only to those who write to the Secretary-General asking to be placed on the Congress mailing list. Secretary-General is: Dr. C. Frankton, IX International Botanical Congress, Science Service Building, Ottawa, Ontario, Canada.

• **A number of outstanding geneticists will be attending the Xth International Genetics Congress in Montreal, Canada, in August, 1958.** Undoubtedly, some of them will be able to come before the Congress opens and some may be able to stay afterwards. Undoubtedly, also, some would like to visit laboratories in the United States, but to do so will need dollars. The Travel Assistance Committee for the Congress is anxious to know which laboratories would like to assist foreign geneticists by inviting one or more either to give a lecture or to serve as a consultant on research. If any funds for lectures or consultations are available for these geneticists, please contact the Committee through the undersigned as soon as possible — *preferably before December 1st.* Harriet B. Creighton, Department of Botany & Bacteriology, Wellesley College, Wellesley 81, Mass.

The list of geneticists now expected to be at the Xth International Genetics Congress include: *Ivar Johannson*, genetics in animal breeding, (animal husbandry, particularly cattle); *H. P. Donald*, genetics in animal breeding, (cattle breeding, particularly monozygotic twins); *Francois Jacob*, Institut Pasteur; *Alan Robertson*, genetics in animal breeding, (quantitative inheritance, both in animal husbandry and in *Drosophila*); *Hans Nachtsheim*, genetics in animal breeding, (genetics of rodents, particularly hereditary abnormalities from a comparative and development point of view); *C. Syrach Larsen*, cytogenetic and plant breeding, (forest genetics); *D. Lewis*, cytogenetics and plant breeding, (self-incompatibility, particularly in fruit trees, but also in other organisms); *H. Kihara*, cytogenetics and plant breeding, (wheat genetics and fruit cytogenetics); *H. Stubbe*, mutation and mutagenesis (mutations, both radiation-induced and spontaneous); *J. R. S. Fincham*, physiological genetics (gene-enzyme relations in *Neurospora*); *E. Hadorn*, physiological genetics, (development and biochemical genetics, particularly in *Drosophila*); *P. Michaelis*, physiological genetics, (cytoplasmic inheritance in *Epilobium*); *N. P. Dubinin*, genetics in evolution, (evolutionary genetics in *Drosophila*); *C. Pavan*, physiological genetics in *Drosophila* and physiology of the salivary gland; *H. Harris*, (human biochemistry); *R. Cappellini*, (human blood groups); *Maurice Lamy*, (twin studies); *Cavelli-Sforza*, (evolutionary genetics); *Jan Böök*, (human genetics); and *Arne Müntzing*, (plant genetics).

• **A clearinghouse of information on psychopharmacology is being established by the Psychopharmacology Service Center of the National Institute of Mental Health.** An extensive collection of the literature in this field, including pharmacological, clinical, behavioral, and experimental studies of the ataraxic, psychotomimetic, and other centrally acting drugs, will be classifield and coded to enable the staff to answer a wide variety of technical and scientific questions. As soon as enough materials have been assembled the Center plans to offer bibliographic and reference service as well as the preparation of critical and analytic reviews of special topics in the field.

In order to accelerate the growth of the literature collection the Center invites persons working in this field to provide three copies of any papers that deal with their work — whether reprints, pre-publication manuscripts, progress reports, informal mimeographed reports, papers read at meetings, or abstracts. Letters outlining work in progress would also be welcome. Any restrictions that authors may wish to place on the Center's use of their papers will be strictly observed. All materials should be addressed to the Technical Information Unit, Psychopharmacology Service Center, National Institute of Mental Health, 8719 Colesville Road, Silver Spring, Maryland.

• **The Northeastern Weed Control Conference** will be held January 8-10, 1958, at the Hotel New Yorker, New York. This is the twelfth annual meeting of this Conference. Further information may be obtained from the secretary, R. J. Aldrich, Farm Crops Department, Rutgers University, New Brunswick, N. J.

• **The Sixth National Conference convened by the United States National Commission for UNESCO** was held No-

vember 6-9, 1957 at San Francisco. The Conference aim was "Asia and the United States—What the American Citizen Can Do to Promote Mutual Understanding and Cooperation". Section titles were: (A) The Mind and the Spirit of Asia—Achieving Understanding Through Philosophies and Religions; (B) The Creative Arts in Asia — Literature, Architecture, Painting, Sculpture, Music, Dancing and the Theater; (C) Science and Technology in Asia and Their Social Impact; (D) Educational Problems in Asia, and the Study of Asia in American Education; (E) Economic Relations in Asian-American Understanding and Cooperation; (F) Asian-American Understanding and Misunderstanding — The Problem of Effective Communication. Representatives of AIBS were in attendance at this Conference.

• **National Science Foundation publications** are available to all scientists who have need for them. Lists of publications are available from the Foundation. Requests should be addressed to the Publications Office, National Science Foundation, Washington 25, D. C.

• **The Lalor Foundation has announced details of the awards which it is offering to college and university faculty members for research in the biological sciences for the summer of 1958.** This is the fourth annual series of such summer awards. The awards are for advanced study and research employing chemistry or physics to attack problems in any field of biology. The studies may be carried on in any institution of the award holders choice. The upper age limit for appointment is 40 years. The awards will usually not exceed $900 for a single man or woman, $1,100 for a married man working in his home institution, and $1,250 for a married man whose principal program is at another institution. Transportation and other expenses are for the account of the award holder. Inquiries respecting Lalor faculty summer research awards should be addressed to the director of the Lalor Foundation, 4400 Lancaster Pike, Wilmington 5, Delaware. Final date for receipt for completed applications is January 14, 1958. A notification regarding appointment will be made March 15, 1958.

• **The Radcliffe Graduate School of Arts and Sciences has announced that applications will be received for the Helen Putnam Fellowship for Advanced Research,** a postdoctoral resident fellowship for women. The holder will enjoy full research facilities at Harvard University and may, if she wishes, live in the Radcliffe Graduate Center. The research may be in any field related to genetics or mental health, including psychology, child development and other fields of social science.

The stipend will be $3500 a year, with possibility of renewal. Application blanks may be obtained from the Secretary of the Graduate School, Radcliffe College, Cambridge 38, Massachusetts. Completed applications should be returned not later than January 15, 1958. Announcement of award will be made on or before February 15, 1958.

• **The United States Civil Service Commission has announced examinations for Fishery Management Biologists and Wildlife Management Biologists.** At the present time there is a shortage of manpower in these professional specialties. The salaries range from $4,525 to $7,570 a year, (grade GS-7 through GS-12). Applications should be made to the Executive Secretary, Board of United States Civil Service Examiners, Fish and Wildlife Service, Department of the Interior, Washington 25, D. C.

• **"Results of 1956 Fungicide Tests"** reprinted from a series of articles appearing in *Agricultural Chemicals*, February through August, may be purchased in bound and covered form for $1.00 per copy by sending orders with remittance to A. B. Groves, Department of Plant Pathology, Virginia Agricultural Experiment Station, R.R. 3, Winchester, Va. The publication of these results is under the sponsorship of the American Phytopathological Society. It is a continuation of the publication of results formerly provided through a Supplement of the Plant Disease Reporter, Plant Disease Epidemics and Identification Section, U. S. Department of Agriculture.

The Temporary Advisory Committee on Collecting and Disseminating Data on New Fungicide Tests of the American Phytopathological Society arranged for the recent publication of data and the continuation of a program for annual publications of Fungicide Test Results in the future. A. B. Groves, Department of Plant Pathology, Virginia Agricultural Experiment Station, Winchester, Virginia, will be in charge of this project during the current year.

• Announcement that the **1958 Plant Science Seminar will be held on the campus of Ferris Institute** in Big Rapids, Michigan, was made by the Committee on Time and Place at the Seminar session recently concluded in Montreal, Canada. Edward P. Claus, Dean of the Division of Pharmacy at Ferris Institute, will serve as Local Secretary for the 35th annual Seminar to be conducted during the week of August 18-22, 1958.

• **The Institute of Laboratory Animal Resources,** of the National Research Council, at its Spring meeting in June of this year, passed the following resolution: "The Institute of Laboratory Animal Resources, cognizant of the need for a broader understanding of animal diseases, both for the practical purpose of providing medical and biological research with the best possible investigative animal materials and for the broader purpose of promoting research on animal diseases for a better understanding of biological and pathological phenomena in general, strongly urges the intensification of basic research in the field of animal pathology and, in particular, of the diseases of animals used in laboratory investigations and testing."

• **Expansion of the physical plant of the Highlands Biological Station** has been made possible by a grant from the National Science Foundation. Construction is now underway. The present laboratory building will be converted into a messhall, a new laboratory constructed and several cottages added. The new facilities will be ready for the 1958 season.

National Science Foundation Grants-in-Aid for support of research at the Highlands Biological Station will again be available for the 1958 season. For further information, write Professor Thelma Howell, Wesleyan College, Macon, Georgia.

• **The new building of the American Institute of Physics,** located at 335 East 45th Street, was dedicated October 21st. Headquarters for America's 20,000 physicists, The American Institute of Physics is a federation of five professional societies, and publishes all of the principal American technical journals of physics.

• **The Institute of Microbiology at Rutgers University is initiating the publication of a series of book-length manuscripts on subjects that relate to the science of microbiology.** Primarily, the series has a two-fold aim: (1) It is designed to offer an outlet for specialized contributions in the field of microbiology that are of relatively limited interest to commercial publishers, and to existing scientific journals. (2) Present plans also concern the publishing of biographical and historical studies in microbiology.

This program is operating with the financial assistance of the Foundation for Microbiology. Although volumes for the series are being assembled by invitation, comments from any scientist are welcome with reference to desirable subjects, or in regard to authors qualified to fill existing needs. Prospective contributors are invited to express their interests. Comments or suggestions may be sent to any member of the Editorial Advisory Committee, or to Vernon Bryson, Institute of Microbiology, Rutgers, The State University, New Brunswick, N. J. Members of the Editorial Advisory Committee are: Vernon Bryson, Rene J. Dubos, Harry Eagle, Michael Heidelberger, A. Lwoff, K. F. Meyer, Francis Gordon, J. R. Porter, Kenneth B. Raper, William J. Robbins, R. Y. Stanier, Edward L. Tatum, Selman A. Waksman, Perry W. Wilson, H. Boyd Woodruff.

• **The Academic Press Inc., has announced the new "Journal of Ultrastructure Research"** to be edited by Fritiof S. Sjöstrand and Arne Engström, both associated with the Karolinska Institutet, Stockholm, Sweden. The Editorial Board consists of: F. B. Bang (U.S.A.), W. Bernhard (France), A. Claude (Belgium), V. E. Cosslett (England), Albert J. Dalton (U.S.A.), John Farrant (Australia), A. Frey-Wyssling (Switzerland), Alan J. Hodge (Australia), Daniel C.

Pease (U.S.A.), J. B. LePoole (Holland), J. T. Randall (England), Ernst Ruska (Germany), W. J. Schmidt (Germany), Hugo Theorell (Sweden), Arne Tiselius (Sweden), T. W. G. Wyckoff (U.S.A.).

Papers on biological material analyzed by means of electron microscopy, X-ray diffraction techniques, X-ray microscopy, polarization optical analysis, and polarized infrared analysis will be acceptable as will those describing techniques and instruments of importance for the development of ultrastructure research. Manuscripts may be submitted in English, French or German. The first volume, priced at $15.00 will consist of four issues. Manuscripts and queries concerning editorial policies should be sent to the Editorial Office, Journal of Ultrastructure Research, Department of Anatomy, Karolinska Institutet, Stockholm 60, Sweden. Subscription orders should be sent to the publishers Academic Press Inc., 111 Fifth Avenue, New York 3, New York.

• **"Perspectives in Biology and Medicine," a new quarterly journal** dedicated to a multidisciplined approach to the problems of biology and medicine has been announced by the Division of Biological Sciences and the Press of the University of Chicago.

Perspectives will present new hypotheses and concepts representing informed thinking; interpretive, selective essays which take stock of the implications of recent and current research and indicate strategy for the future; and, because perspective and inspiration can also be gained by looking to the past, reviews by great men in science and medicine of their formative years and their philosophy of research.

Dwight J. Ingle and S. O. Waife are editors of the publication. An 11-man editorial board and a 12-man advisory board will assist them.

Further information about the new journal may be obtained by writing to the Editorial Office, 950 East 59th St., Chicago 37, Illinois.

• **San Jose State College, California,** took possession this fall of a new two and a half million dollar science building addition. This new facility approximately doubles the space and facilities for the program in the natural sciences. It will be appropriately dedicated during the current school year.

• **The 1958 meeting of the Biophysical Society** will be held in Cambridge Mass. on February 5-7, 1958. Abstracts and papers to be presented at the meeting must be received no later than Monday, December 2, 1957.

The Program Committee recognizes that an important function of the Society is to provide all members with an opportunity to become acquainted with the various areas of biophysics. To this end, a number of invited papers are being arranged as general introductions to specially selected subjects. It is hoped that the contributed papers on these special subjects can then be presented in sessions in which more detailed discussion will be possible. This year the special subjects are to be "microsomal particles, and their structure and function" and "muscle proteins and contractile mechanisms". About half of the meeting time will be devoted to contributed papers from all fields of biophysics and half to plenary sessions at which the invited papers will be presented.

An important feature of this meeting will be the business sessions devoted to the adoption of a constitution and bylaws. Proposals on these will be circulated in advance by the Council, to members. The establishment of a journal will also be discussed. Chairman of the Local Committee is Arthur K. Solomon, Biophysical Laboratory, Harvard Medical School, Boston, Massachusetts.

• **The Special Committee on Oceanography (SCOR) of the International Council of Scientific Unions (ICSU)** met in August at the Woods Hole Oceanographic Institution. This committee was formed earlier in the year at a meeting in Göteborg, Sweden, where the IGY programs were discussed. The Committee was formed to initiate long-range planning groups designed to take advantage of and to continue the international cooperation begun by the IGY and to take care of the areas of modern oceanography which are not included in IGY studies. The possibility of an international meeting on marine sciences to be held in this country in 1959, under the auspices of the American Society for the Advancement of Sciences (AAAS) was discussed. That the marine scientists of the world should meet more often and that the younger oceanographers should be included were points of agreement. The tools of the marine scientists came under scrutiny and it was suggested that new instruments should be standardized as soon as possible after their development so that they can come into world-wide use.

The efficiency of research vessels was not found satisfactory and it was agreed that some centralization is needed to make the best possible use of ships. The Committee, under the provisional chairmanship of Roger Revelle, Director of the Scripps Institution of Oceanography, University of California included: Anton Bruun, Denmark; Commander R. A. Capurro, Argentina; Y. Miyake, Japan; L. Zenkevitch, U.S.S.R.; M. N. Hill, England; G. E. R. Deacon, England; G. Böhnecke, West Germany; H. Mosby, Norway; Steemann Nielsen, Denmark; N. B. Marshall, England; Y. LeGrand, France; N. W. Rakestraw and C. O'D. Iselin, U.S.A.

• **A six-part program has been proposed by a committee of the National Society for Medical Research to relieve the increasingly serious shortage of cadavers** threatening the quality of medical education in the United States.

The committee's program includes: (1) A survey of public opinion toward anatomical studies. (2) A series of conference with religious leaders, public welfare administrators, undertakers, hospital superintendents and other persons concerned with the disposition of bodies. (3) A program of education for persons in the health professions. (4) A general public educational program. (5) The drafting of modern laws making bodies available through bequest (in 39 states, a person's body is not his own to give after death). (6) Legal reference service, with standardized forms and procedures for bequeathing a body to a medical school.

• **The Arid Zone Research Institute officially opened earlier this year at Beersheba in Israel** marks a new phase in the studies being carried out in the Negev Desert and a general advance in international desert research. The Institute is one of the pilot projects in arid zone research approved by UNESCO at its General Conference in New Delhi last November. Similar centers in Egypt, India and Pakistan will receive assistance and equipment from UNESCO as part of the overall program.

Projects planned at the Beersheba Institute include an investigation of the response of desert to various stress conditions and a study of building clothing and nutritional requirements in the desert. A special laboratory will be set up to study the mineral resources of the Dead Sea, and the interrelation between botanical, climatic, and geological features of the area. Experiments will also be conducted on methods of purifying saline and brackish waters for drinking purposes.

• **The University of Buffalo Graduate School of Arts and Science has announced new programs leading to Masters Degrees in the natural sciences** and in the social sciences. These programs are particularly designed for teachers, librarians, technicians and others who desire additional work in a broad area while meeting special professional requirements. Masters of Science degrees may be chosen in the fields of biology, geology, mathematics, physics and chemistry.

• **Brandeis University in Waltham, Mass. has established a graduate department of biochemistry.** The department is the result of a gift made to the University by the Dorothy H. and Lewis S. Rosenstiel Foundation. Appointments to the new staff include Nathan O. Kaplan, of the McCollum-Pratt Institute; Martin D. Kamen, of Washington University Medical School; William F. Loomis of the Loomis Laboratory; Mary Ellen Jones, Mass. General Hospital; Lawrence Levine, New Your State Department Laboratory; Lawrence Grossman, National Institutes of Health and William P. Jencks of Harvard University. The department offers a program leading to the Ph.D. degree. The program of the department was begun July 1, 1957.

• **Washington University (St. Louis) has announced a gift of $200,000** from the Anheuser-Busch Charitable Trust for the construction of a new laboratory for research in molecular and cellular biology. The National Institutes of Health contributed an additional grant of $150,000 making possible completion of the building, which will be named the Adolphus Busch III Laboratory of Biology. At the same time the University announced a new program of teaching and research in biology. The program will encompass education and research in a general area involving life processes of cells and the chemical and physical reactions which govern them. Two new staff members have been added to the faculty of the department of zoology and the school of botany. The new program is to be established as a joint activity in those departments with the cooperation of the departments of chemistry and physics.

• **The Society of American Bacteriologists has announced that funds provided by the Difco Laboratories (Detroit) are available as President Fellowships** to members of the society, 35 years of age or under, for visits to laboratories, to study techniques and procedures and to obtain specialized training concerned with their research programs. The funds may be used to meet transportation and maintenance expenses for short periods of study. The fellowship grant is not a fixed sum but is determined by the merit of the proposal and the availability of funds. Further information may be obtained from R. L. Starkey, Agricultural Experiment Station, New Brunswick, New Jersey.

• **The American Philosophical Society is accepting applications for grants in support of basic research,** in accordance with the following general principles. Grants may be made for research in any field of scholarship and may include funds to cover travel and other expenses in connection with collection of material for research. Grants are not made toward the payment of salaries, members of the staff of an educational or scientific institution, or for fellowships or scholarships, or for expenses in connection with the preparation of a doctoral dissertation. A long continuing project, except in its initial stages, will not be supported. Applications should be typewritten on forms which may be obtained by addressing the Executive Officer, American Philosophical Society, 104 S. 5th St., Philadelphia 6, Pa.

• **The U. S. National Museum and Stanford University are sharing in the donation of a collection of type specimens of fishes,** described principally by William Beebe and his staff. Division of this collection was made on a geographical basis. Types and species described from Atlantic Ocean localities were deposited in the National Museum; those in the Pacific in the National History Museum of Stanford University. Detailed lists of the type specimens of fishes, resulting from Beebe's work, and their present location is in preparation.

• **The late Alfred C. Kinsey's collection of 5.5 million gall wasps** has been donated to the American Museum of Natural History, New York, by Mrs. Kinsey. In addition to the entire collection, the museum received several hundred volumes used by Dr. Kinsey in his entomological research.

• **The Arctic Institute of North America** (*AIBS Bulletin*, June 1956) **has just completed the most extensive single season yet undertaken.** Thirty-seven grants and aid were awarded for northern studies this year, as against 31 in 1956. Twenty-five of the current investigations were in the biological sciences, including studies directed towards a better understanding of the physiological adaptation mechanisms of arctic mammals and fishes. The Arctic Research Laboratory of the Office of Naval Research (Point Barrow, Alaska) was the base for 16 of the summer studies. The program of the Arctic Institute receives support from the Office of Naval Research, the Canadian Government, The Sir Fredrick Banting Fund and private industry and individuals on both sides of the border.

• **The Roscoe B. Jackson Memorial Laboratory (Bar Harbor, Maine) this year shipped more than 470,000 mice** to scientists, hospitals and research centers all over the world. 10,000 to 15,000 mice are now being shipped out of the Laboratory each week. This represents a considerable increase over previous years. Despite this rise in shipments, the Laboratory is unable to meet the ever increasing demand. A new $500,000 addition to the Laboratory will enable mouse production to expand an additional 300,000 mice per year. The new addition should be in complete operation by early spring. Jackson Laboratory is the only center that breeds and constantly renews strains of pedigreed mice.

• **"Radioactive Contamination of Certain Areas of the Pacific from Nuclear Tests—a Summary of the Data from the Radiological Surveys and Medical Examinations" has now been released by the Atomic Energy Commission.** This report brings together the principal data on environmental contamination from radioactive fallout following the March 1st, 1954 thermo-nuclear detonation at the Eniwetok Proving Grounds. It includes 10 radiological surveys made in the Pacific by the Applied Fisheries Laboratory of the University of Washington, U. S. Naval Radiological Defense Laboratory, Health and Safety Laboratory of the New York Operations Office of the AEC and the Office of Naval Research. The report also contains excerpts from the findings of American medical teams who examined the exposed people of the Marshall Islands. The report may be obtained for 50c from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

• **The American Chemical Society has launched a three million dollar drive for funds to build a new 8 story national headquarters** on the site of the society's present building at 1155 16th St., N.W., Washington, D. C. Besides offices, the new building will have a library, a meeting room seating 250 people, accommodations for committee meetings and a lobby large enough to make possible educational displays.

• **The University of Puerto Rico has announced the establishment of a Radio-isotope Techniques Training Center,** following a pattern similar to the special training division of the Oak Ridge Institute of Nuclear Study. The Atomic Energy Commission has financed the Center for the purpose of providing training in radio-isotopes techniques for Latin American scientists. The dates for courses that will be offered during the remainder of the academic year are: November 4 to November 29, 1957; January 3 to January 31, 1958; March 3 to March 28, 1958 and May 5 to May 30, 1958. Further information may be obtained from: Director, Centro de Entrenamiento en al Manejo de Radioisotopes, Universidad de Puerto Rico, Rio Riedras, Puerto Rico.

• **Six Central American Countries (Panama, Costa Rico, El Salvador, Guatamala, Honduras and Nicaragua) are currently hosts to the Third U. S. Atoms-for-Peace Mission.** The purpose for this mission is a discussion of the programs for practical application of nuclear energy in agriculture and medicine and in nuclear education and training. The U. S. team is meeting with scientists, educators and government officials.

• **The National Science Foundation will award grants to partially defray travel expenses for a limited number of American scientists wishing to participate in the meetings of the International Federation of Electron Microscope Societies.** This meeting is to be held in Berlin, Germany, September 10-17, 1958. Application blanks may be obtained from the National Science Foundation, Washington 25, D. C. Completed application forms must be submitted by February 15, 1958.

• **A new AAAS-Campbell Award for Vegetable Research has just been established** by Campbell Soup Company, and will be given for the first time this year. The Award consists of $1,500 and a bronze medal, given for "an outstanding single research contribution, of either fundamental or practical significance, relative to the production of vegetables, including mushrooms, for processing purposes, in the fields of horticulture, genetics, soil science,

plant physiology, entomology, plant pathology, or other appropriate scientific areas". Work in food technology and food processing are not included; the emphasis is on basic research and applications thereof variously concerned with crop production, prior to crop utilization or crop processing.

The one or more papers reporting this single research should have been published —or the MSS accepted for publication— in a recognized scientific journal, not more than two years prior to the date of granting the award, which is open to all residents of the United States and Canada. Travel expenses for the recipient, to attend the AAAS meetings and to receive the award in person, are paid in addition.

The Award Committee is composed of a chairman appointed by the AAAS and official representatives of six affiliated societies, namely: American Phytopathological Society, American Society for Horticultural Science, American Society of Agronomy, American Society of Plant Physiologists, Entomological Society of America, and the Genetics Society of America. Members of the Award Committee are: Louis P. Reitz (Vice-president for AAAS Section O—Agriculture), USDA, Agricultural Research Service, Beltsville, Maryland, Chairman; G. J. Haeussler (Entomological Society of America); Sterling B. Hendricks (American Society of Plant Physiologists); Iver J. Johnson (American Society of Agronomy); F. C. Stark, Jr. (American Society for Horticultural Science); G. Ledyard Stebbins, Jr. (Genetics Society of America); E. E. Wilson (American Phytopathological Society). Nominations for this Campbell Award may be made to any member of the Award Committee or to the Chairman.

• **Organized groups interested in fish and game, conservation or natural history are being offered free hall accommodation in which to hold their meetings during the Northeast Wildlife Conference** meeting which is being held for the first time in Canada, on January 4-7, 1958, in the Sheraton-Mount Royal Hotel, Montreal.

Wildlife specialists from eleven states and six Provinces will attend the meetings. Everything that concerns game and fish will be discussed, and aside from the special technical sessions on January 6-7 there will also be open meetings of interest to outdoorsmen, students, etc. Groups wishing to avail themselves of the offer of halls for their own meetings or any one who would like to attend should communicate with the Chairman of the Northeast Wildlife Conference, Dr. Gustave Prevost, University of Montreal, G 3, Montreal.

In addition to the use of free meeting space, groups may also secure the following: Groups can be addressed if so desired, by one of the outstanding wildlife authorities who will be present for the Conference. The Conference can facilitate arrangements which the group may wish to make with the hotel for holding a luncheon. The Conference will provide desk space where a group can acquaint the public with its aims and activities and recruit new members. The program of a particular group can be printed in the general program of the Conference. Groups as well as individuals, living away from Montreal, are invited to avail themselves of the services of the Conference staff to book hotel, motel or similar accommodation. Groups are invited to set up their own exhibits in the hotel's Sheraton Hall, where the State of New York, the State of Maine, etc., already have planned to exhibit. Facilities are provided for showing films, slides, opaques or film strips. The Conference secretarial staff will distribute leaflets or folders on behalf of any accepted group.

• **Future International Congresses of interest to biologists:**

November 18–December 9, 1957. Bangkok, Thailand. 9th Pacific Science Congress, Pacific Science Association, under the auspices of His Majesty's Government of Thailand and the Science Society of Thailand. Dr. Harold J. Coolidge, Pacific Science Board, National Research Council, 2101 Constitution Avenue, Washington 25, D. C.

(Tentative) 1958. Sapelo Island, Georgia. Conference on Salt Marsh Research, sponsored by the National Science Foundation. Dr. Robert A. Ragotzkie, University of Georgia Marine Station, Sapelo Island, Georgia.

April 11–18, 1958. Nice, France. 15th International Horticultural Congress. International Committee for Horticultural Congresses. Secretariat General, 84, Rue de Grenelle-Paris VII, France.

June 23-26, 1958. Wolfville, Nova Scotia. Agricultural Institute of Canada, Annual Meeting and Convention; Agricultural Pesticide Technical Society, Canadian Agricultural Etonomics Society, Canadian Phytopathological Society, Canadian Society of Agronomy, Canadian Society of Animal Production, Canadian Soil Science Society, and Canadian Society for Horticultural Sciences, Annual Meetings. Secretary, Agricultural Institute of Canada, Grindley Hall, 338 Somerset Street, W., Ottawa 4, Canada.

Summer, 1958. Mexico, D. F., Mexico. 11th World's Poultry Science Congress. Major Ian Macdougall, O.B.E., Agriculture House, Knightsbridge, London, S.W. 1, England.

July 7, 1958. London, England. Colloquium on Zoological Nomenclature, International Trust for Zoological Nomenclature. Mr. Francis Heming, 28, Park Village East, Regent's Park, London, N.W., 1, England.

July 10–14, 1958. Harpenden, Hertfordshire, England. Colloquium on Methods of Research in Soil Zoology, International Group for the Study of the Fauna of the Soil. J. d'Aguilar, Station centrale de Zoologie agricole, Route de St.-Cyr, Versailles, France.

July 16–23, 1958. London, England. 15th International Congress of Zoology. The Registrar, c/o British Museum (Natural History), Cromwell Road, London, S.W. 7, England.

1958. London, England. International Union of Biological Sciences, 13th General Assembly. Chairman, Division of Biology and Agriculture, National Research Council, 2101 Constitution Avenue, N.W., Washington 25, D. C.

August 4-10, 1958. Stockholm, Sweden. 7th International Congress of Microbiology, International Association of Microbiologists. Mr. F. C. Harwood, Business Manager, Society of American Bacteriologists, Waverly Press. Mt. Royal and Guilford Avenues, Baltimore, Maryland.

August 10–16, 1958. Burlington, Vermont. International Congress on Radiation Biology. Mr. John S. Coleman, Division of Physical Sciences, National Academy of Sciences, 2101 Constitution Avenue, N.W., Washington 25, D. C.

August 13–19, 1958. Galway, Ireland. 3rd International Seaweed Symposium and Symposium on Intertidal Ecology (An exhibition devoted to the technology and commercial products of seaweeds will be held in conjunction with the Symposium). Secretariat, 3rd International Seaweed Symposium, University College, Galway, Ireland.

August 20–27, 1958. Montreal, Canada. 10th International Congress of Genetics, International Union of Biological Sciences, Human genetics, Medical genetics. Mr. J. W. Boyes, General Secretary, 10th International Congress of Genetics, McGill University, Montreal, Canada.

August 20–September 1, 1958. Ottawa, Canada. 4th International Biometric Conference, and International Symposium on Biometrical Genetics. International Biometric Society of the International Union of Biological Sciences. Dr. M. J. R. Healy, Secretary, Biometric Society, Rothamsted Experimental Station, Harpenden, Hertfordshire, England.

September 1–6, 1958. Vienna, Austria. 4th International Congress of Biochemistry, International Union of Biochemistry. O. Hoffman-Ostenhof, Wahringestr, 42, Vienna IX, Austria.

September 1–13, 1958. Geneva, Switzerland. 2nd International Conference on the Peaceful Uses of Atomic Energy, sponsored by the United Nations. United Nations Advisory Committee on Peaceful Uses of Atomic Energy, The United Nations, New York, N. Y.

September 5-13, 1958. Lisbon, Portugal. 6th International Congress of Tropical Medicine and Malaria. Professor Manuel R. Pinto, Secretary-General, Instituto de Medecina Tropical, Lisbon, Portugal.

September 11–20, 1958. Athens, Greece. International Union for Conservation of

Nature and Natural Resources. 6th General Assembly, and 7th Technical Meeting on Soil and Water Conservation. International Union for Conservation of Nature and Natural Resources, 31, rue Vautier, Brussels, Belgium.

November 16–23, 1958. Washington, D. C. International Conference on Scientific Information, sponsored by American Documentation Institute, National Academy of Sciences-National Research Council, and the National Science Foundation. Secretariat, International Conference on Scientific Information, NAS/NRC, 2101 Constitution Avenue, Washington 25, D. C.

Summer, 1959. Austria. 14th International Limnological Congress, International Association of Theoretical and Applied Limnology of the International Union of Biological Sciences. International Association of Theoretical and Applied Limnology, The Ferry House, Far Sawrey, Ambleside, Westmoreland, England.

August 9–15, 1959. Buenos Aires, Argentina. 21st International Congress of Physiological Sciences. Professor A. O. M. Stoppani, Faculdad de Ciencias Medicas, Paraguay 2155, Buenos Aires, Argentina.

August 19–29, 1959. Montreal, Canada. 9th International Botanical Congress, International Union of Biological Sciences (IUBS). Dr. C. Frankton, Secretary-General, 9th International Botanical Congress, Science Service Building, Carling Avenue, Ottawa, Ontario, Canada.

(Tentative) 1959. Barcelona, Spain. 9th International Congress on the History of Science. Professor Jean Vernet, Via Layetona 141, Barcelona, Spain.

April 10–17, 1960. New York, N. Y. 7th International Congress of Anatomy. Professor Louis Flexner, School of Medicine, University of Pennsylvania, Philadelphia, Pa.

August, 1960. Madison, Wisconsin. 7th International Congress of Soil Science, International Society of Soil Science. Professor Richard Bradfield, Department of Agronomy, Cornell University, Ithaca, New York.

• **Developmental Biology Conference Series, 1956.** Development and growth used to be studied mostly in separate compartments—as embryology, or plant physiology, or nutrition, or oncology; as seriation of stages of chick embryos; as cell division in fish eggs or plant root tips; as growth curve of children; as hormone response of plumage; as spread of a fungus; as repair of a broken bone or the swelling of a diseased spleen. Yet, in reality, all of these are merely isolated aspects of one broad continuous spectrum of phenomena, varified manifestations of the same basic principles and elementary processes: multiplication of organic mass—Growth; diversification of that mass — Differentiation; pattern formation — Morphogenesis; progressive change — Maturation and Aging; and the repair or reproduction of patterns after disturbance — Regulation and Regeneration.

This unity of subject matter in the field of Developmental Biology has received renewed emphasis in a major and highly successful undertaking organized in 1956, known as the "Developmental Biology Conference Series 1956". It consisted of a series of coordinated and interdisciplinary conferences, symposia, and workshops held in the United States from early June to mid-October, organized under the sponsorship of the Biology Council (Paul Weiss, Chairman) of the Division of Biology and Agriculture, National Academy of Sciences-National Research Council, with the generous financial support of the American Cancer Society; American Cyanamid Company; Atomic Energy Commission; Departments of the Air Force, Army and Navy (Medical Services); Diamond Alkali Company; the Fulbright Fellowship Program; International Union of Biological Sciences; Merck and Company, Inc.; National Institutes of Health; National Science Foundation; Office of Naval Research; Chas. Pfizer & Co., Inc.; The Rockefeller Foundation; Rohm & Haas Co.; E. R. Squibb & Sons; Department of State; and some private donors.

Between 200 and 300 American and 54 overseas experts (the latter representing 19 countries) in the fields of anatomy, biochemistry, biometry, biophysics, botany, cytology, embryology, endocrinology, genetics, histology, immunology, microbiology, neurology, nutrition, oncology, pathology, physiology, radiology, surgery and zoology participated by invitation in one or more of the following events: (1) *Conference of the Oak Ridge National Laboratory on Biocolloids*, Oak Ridge National Laboratory, Tenn., April 12-14; (2) *Cold Spring Harbor Symposium on Gene Action in Relation to Development*, Long Island Biological Association, New York, June 4-12; (3) *Workshop in Developmental Biology*, Bar Harbor, Maine, June 18-28; (4) *International Congress of Developmental Biology*, with Symposia on Regeneration of Vertebrates and Embryonic Nutritional Requirements and Utilization, Brown University, Providence, R. I., July 23-26; (5) *International Symposum on Cytodifferentiation*, Brown University, Providence, R. I., July 27-31; (6) *Work Conference on Environmental Influences on Prenatal Mammalian Development*, R. B. Jackson Memorial Laboratory, Bar Harbor, Maine, August 2-4; (7) *Work Conference on Immunology and Development*, R. B. Jackson Memorial Laboratory, Bar Harbor, Maine, August 7-9; (8) *Work Conference on Physiology of Insect Development, Growth and Metamorphosis*, Macdonald College, Ste. Anne de Bellevue, Quebec, Canada, August 14-16; (9) *Work Conference on Dynamics of Proliferating Tissues* (with Emphasis on Hematopoiesis), Brookhaven National Laboratory, New York, September 5-8; (10) *Work Conference on Endocrines in Development*, Ramshead Inn, Shelter Island, New York, September 11-13; (11) *Work Conference on Mitogenesis*, Argonne National Laboratory, Lemont, Ill., September 24-26; (12) *Work Conference on Biological Foundations of Wound Healing and Tissue Repair*, Rockefeller Institute for Medical Research, New York, October 2-4; (13) *Tissue Culture Association Decennial*, Woodstock, Vermont, October 8-12.

Except for the International Congress of Developmental Biology, at which the participants presented formal papers, all meetings followed an informal roundtable pattern of procedure. In each, anywhere from fifteen to thirty-five investigators from various disciplines, under the programming guidance of a chairman, devoted themselves not primarily to a display of their individual research products, but to a concerted review and evaluation of the bearing that the content of each specialty might have on crucial issues of Developmental Biology. The major objective throughout was the critical distillation of all available knowledge on a given problem, the clarification of concepts, and the resolution of incongruities and inconsistencies among the view current in different areas. Thus was provided the setting for a unique group exercise in which each participant contributed his own share to the unification, strengthening and elucidation of Developmental Biology, and from which he, in turn, gained fresh orientation for his own specialized tasks.

The resultant free give-and-take of information, illustrations, questions, criticisms, and conclusions not only revealed many existing gaps of knowledge and understanding, but at the same time furnished fresh pointers to the filling of those gaps by specific experiment or re-interpretation. No less productive than the bringing out of constructive suggestions, was the weeding out of misunderstanding rooted in the deficiencies of past interdisciplinary correlation. In several of the events, particularly the Bar Harbor Workshop and the Brown University series, advanced students took part as auditors and active discussants, thus benefiting directly from the manner of free discourse. Mature investigators were equally impressed with the advantage of this type of conference, which significantly supplements the more common practice of holding group conferences and symposia on specialized topics of great current interest by bringing together investigators from many disciplines in ever new combinations for the clarification of basic issues, so that Developmental Biology may gain in consistency and inner coherence by the firm cross-linking of its separate lines of specialization.

On the technical side, this objective was aided by the fact that many of the participants were enlisted in more than one conference—some in as many as five. In this way, their contributions could be brought to bear on a great variety of problems in different contexts, and their own views, in turn, could be enriched and receive the critical cross illumination that flows auto-

matically from exposure to new perspectives. On the practical side, this sharing of participants among several separate events has made possible the invitation of a considerably larger number of participants from abroad than could have been accommodated within the limited funds were each to have made his trip for a single occasion. Concomitantly, it enabled them to extend their stay in the United States and to visit numerous laboratories to mutual advantage.

On the whole, the experience with this undertaking encourages its repetition in other fields, for this scheme of a series of interrelated and coordinated conferences seems to fill a real need as intermediate between the mammoth international congresses at one extreme and the small and independent single-purpose conferences at the other.

Plans are underway to publish the proceedings of the conferences in a single series, some as third-person reports by recorders specially appointed to each conference and others as condensed and edited transcripts of the dialogue.

• **The 250th anniversary of the birth of Carolus Linnaeus** was commemorated by a symposium at the University of Uppsala, Sweden, May 29-30, 1957. Twenty-two foreign and six Swedish scientists participated. Following the commemoration symposium the Faculty of Mathematics and Natural Sciences granted honorary degrees to the following persons: H. H. Allan, (New Zealand); J. Braun-Blanquet (France); P. H. Fries (Sweden); J. S. Huxley (Great Britain); J. Iversen (Denmark); H. Lindberg (Finland); E. Mayr (U.S.A.); R. Nordhagen (Norway); J. Ramsbottom (Great Britain); B. Rensch (Germany) and J. Westerdijk (Netherlands). An Honorary Doctorate in Agronomy was granted at the same time to Jens Clausen of Stanford University and Jay L. Lush of Iowa State College.

• **Roy E. Marshall** retired on September 30 as the assistant director of the Michigan Agricultural Experiment Station at Michigan State University after more than 37 years service. Prior to becoming an administrator in 1950, he was a member of the department of horticultural staff and chairman of Food Technology.

• **C. G. Goodchild,** professor of biology, Emory University, has accepted the chairmanship of the department of biology. **W. D. Burbanck** has resigned and will be on leave of absence during 1957-58. Dr. Burbanck's address during the year will be The Marine Biological Laboratory, Woods Hole, Mass.

• The South Carolina Academy of Science made two research grants for 1957-58. One of these grants was awarded **K. Nolon Carter** of Presbyterian College and the other went to **E. A. Crawford** of Limestone College.

• The Annual Jefferson Award, made available through the generosity of Phipps and Bird Company of Richmond, Virginia, has been awarded to **D. J. Richey** and **C. L. Morgan,** both of Clemson College, for their paper "Control of Leucocytozoon Infection in Turkeys".

• **Ralph R. Huestis,** head of the department of biology at the University of Oregon, Eugene, retired this year. He becomes professor emeritus of biology and will continue part-time teaching and research. **D. P. Scheer,** acting head of the department of biology, University of Oregon during 1956-57 will be on sabbatical leave during 1957-58. He will be carrying on research on crustation physiology in France under the auspices of a Guggenheim Fellowship. **C. W. Clancy** will be acting head during 1957-58.

• The biology department of the University of Oregon, recently made these additions to the permanent staff: **Peter W. Frank,** University of Missouri, Associate Professor; **Melvin J. Cowen,** Harvard University, Assistant Professor; **Richard W. Castenholz,** Washington State College, Instructor.

• The University of Cincinnati Graduate School of Arts and Science has appointed five faculty fellows. These include **Margaret H. Fulford,** botany and bacteriology and **Milan Logan,** biological chemistry. Dr. Fulford is the first woman to be so honored. The rank of fellow was created in 1923 at the University of Cincinnati to promote scholarship and recognize faculty members who contribute significantly to scholarly activities through published research work.

• **James B. Ross,** educational representative in the Southeastern U. S. for W. B. Saunders Co., has assumed new duties in the home office in Philadelphia as Associate Editor in the College Department. In this capacity, he will assist Tyler Buchenau in the development and evaluation of college textbooks.

• Recent appointments and changes in the staff of the New York Botanical Garden include: **Richard M. Klein,** presently associate curator becomes Alfred H. Caspary curator; **Arthur Cronquist,** presently associate curator, as curator and **John J. Wurdack,** presently assistant curator, as associate curator. Effective July 1, 1957 **David D. Rogers** became curator of economic botany.

• **Donald P. Rogers,** who has been curator in charge of cryptograms since 1947, left the New York Botanical Garden on September 1 to become professor of botany at the University of Illinois.

• **H. B. Tukey,** head of the Dept. of Horticulture, Michigan State University, was awarded an Honorary Degree of Doctor of Horticultural Science at Hanover Institute of Technology, Hanover, Germany, July 12, 1957.

• **Harold Bold,** formerly at Vanderbilt University, Tenn., has accepted an appointment as professor in the Dept. of Botany at the University of Texas, Austin.

• **Jacques Cattell,** has resigned as president of the Science Press to assume the position of manager of Pergamon Press in the United States with title of Vice-President and Scientific Editor. Mr. Cattell will continue as Editor of *American Men of Science* and the *Directory of American Scholars,* now published by R. R. Bowker Company.

• **Roger D. Reid,** has been named Director of the Biological Science Division of the Office of Naval Research, succeeding **Orr E. Reynolds,** who has been appointed Director, Office of Sciences, Asst. Secretary for Research Development, Office of the Secretary of Defense. Dr. Reid has served as head of the Microbiology Branch of the Biological Science Division since 1948.

• **Ira Judson Condit** and **Julius Enderud,** noted horticulturalists, were awarded the distinguished Oberly Memorial Award for the best bibliography in the field of agriculture at the 76th Annual Conference of the American Library Association (Kansas City, Mo., June 1957). The winning bibliography was titled "A Bibliography of the Fig", and was published in Hilgardia, 25 July 1956, a journal of agricultural science, published by the California Agricultural Experiment Station of the University of California at Berkeley.

• **Arthur Loveridge,** Curator of Reptiles and Amphibians at the Museum of Comparative Zoology at Harvard University, recently retired from his post. During his many East African expeditions, he collected over 8,000 specimens of reptiles and 11,000 amphibians, as well as 3,436 mammal skins and skulls, and has published more than 230 scientific papers.

• **William G. Cochran** joined the staff of Harvard University as Professor of Statistics July 1, 1957.

• Western Illinois State College, Macomb, Illinois, has announced the appointment of **Charles L. Kramer,** botany department, University of Kansas and **Frank B. Kulfinski,** botany department, Iowa State College to the staff of the Department of Biological Sciences, effective September 1957.

• The appointment of **Paul E. Klopsteg** as associate director for research, of the National Science Foundation has been announced by Alan P. Waterman, Director. Dr. Klopsteg will now be responsible for the Foundation's activity in support of basic research in the sciences.

• Three recent appointments in the Division of Biological Sciences of the University of Chicago included: **Albert Dorfman** to full professor in the department of pediatrics; **Robert W. Wissler** to full

professor in the department of pathology and **Birgit Vennesland** to full professor in the department of biochemistry.

• **Robert L. Sinsheimer** has been appointed professor of biophysics at the California Institute of Technology.

• **Paul A. Weiss,** Member and Professor of the Rockefeller Institute and head of the laboratory of developmental biology recently received the 500,000th microscope made by the century-old firm of Ernst Leitz, of Germany. Dr. Weiss, is the first American to be so honored. Robert Koch, discoverer of the tubercle bacillus and founder of modern bacteriology, received the 100,000th Leitz microscope in 1907; Paul Ehrlich, pioneer in chemotherapy, the 150,000th in 1912; Martin Heidenhain, histologist, the 200,000th in 1921; Ludwig Aschoff, founder of modern pathology, the 300,000th in 1930; and Gerhard Domagk, Nobel prize winner for chemotherapy, the 400,000th in 1949.

• **Paul Scott Stokely** has joined the College of Steubenville, Ohio, as associate professor of biology.

• The Illinois Institute of Technology, has announced the appointment of **Harold W. Bretz,** instructor of biology. Dr. Bretz received the Purdue biological society research paper award during the past year.

• **Charles W. Rees,** head of the Section on Protozoal Diseases, NIAID, National Institutes of Health, retired September 10 after 30 years of Government service. For the past 18 years he has been with the Laboratory of Tropical Diseases. Dr. Rees plans to continue his work at the Northwestern University School of Medicine, where he will be associated with the research project on amoebiasis.

• **Frans Verdoorn,** Managing Editor of the Chronica Botanica Co. and Secretary of the International Biohistorical Commission, of Waltham, Mass. has been appointed Director of the new Biohistorical Institute of the University of Utrecht, the Netherlands. This Institute, now being set up in conjunction with Professor Lanjouw's Botanical Museum and Herbarium, will concern itself with the cultural, historical, other humanistic and related aspects of the pure and applied life sciences, with some special reference to the plant sciences. It will be located in a building at 187 Nieuwe Gracht, Utrecht.

The publication program of the Chronica Botanica Co. has been taken over by the Ronald Press Co. of New York, effective October 1, 1957. Dr. Verdoorn will act as Consulting Editor.

• **Ralph W. Chaney,** professor of paleontology in the Department of Paleontology at the University of California, Berkeley and Curator of the Paleobotanical Collections in the University's Museum of Paleontology retired July 1, 1957. Dr. Chaney is an authority on the tertiary plants of Western America and Eastern Asia. He has been at the University of California since 1930.

Wayne L. Fry has been appointed assistant professor in the department of paleontology and Curator of the Paleobotanical Collections to fill the vacancy created by Dr. Chaney's retirement. Dr. Fry was formerly with the Geological Survey of Canada.

• **Truman G. Yuncker,** emeritus professor of botany and Curator of the Herbarium at DePauw University is spending a year's leave of absence, 1957-58, in a study of Jamaican flora at the University College of the West Indies in Jamaica. Dr. Yuncker was chairman of the botany-bacteriology department of DePauw University from 1921 until June of this year.

• **Henry A. Jones,** USDA, has retired after 20 years of service. In 1953 he was awarded the USDA's distinguished service award, for his achievements in horticultural research at the Department's Agricultural Research Center, Beltsville, Maryland. Dr. Jones has now joined the staff of an El Centro, California seed concern as director of research.

• **Henry Koffler,** professor of bacteriology at Purdue University, has received the Eli Lilly Research Award in bacteriology and immunology at the recent meetings of the Society of American Bacteriologists.

• **Warren S. Wooster,** assistant research oceanographer at Scripps Institution of Oceanography (University of California) is on one year's leave of absence to direct the Marine research program of the Republic of Peru. He will be stationed in Lima. Under an agreement between the Peruvian Council of Hydrobiological Investigation, Scripps Institution and The Inter-American Tropical Tuna Commission, the Scripps Institution is to train Peruvian oceanographers and give leave of absence to staff members chosen to aid the Peruvian Research studies. In return the Institution will receive data collected in Peruvian waters.

• **Joshua Lederberg** has been named half-time chairman of the Department of Medical Genetics at the University of Wisconsin. The remainder of Dr. Lederberg's time will be spent in the Department of Genetics of the College of Agriculture.

• **Thomas G. Phillips** has been named emeritus professor at the University of New Hampshire. Dr. Phillips has been professor of agriculture and biological chemistry at the University for 32 years.

• **Phillip V. Stone** has been named Director of the Insecticide Division of the Wisconsin Alumni Research Foundation Laboratories. He succeeds **George S. Kido** who left the Foundation July, 1957 to accept the position as Director of Product Development of the West Coast Division of O. M. Scott & Sons Co.

• **Gerald A. Thomas** has been appointed chairman of the Division of Natural Sciences at San Francisco State College. The Division, which includes mathematics, has 40 professors and instructors on the staff. It is now located on a new campus of 92 acres in Southwestern San Francisco. Dr. Thomas was formerly Business Manager of the Florida Section of the American Chemical Society.

• **George W. Nace** has been appointed associate professor of zoology at the University of Michigan. Dr. Nace was formerly on the faculty of Duke University.

• **James McGinnis** has been appointed chairman of the Department of Poultry at State College of Washington. He replaces **J. S. Carver,** who is now acting director of Washington Agricultural Experiment Station.

• **Roger Adams,** chemistry professor and head of the Department of Chemistry at the University of Illinois, received an honorary degree from the University of Illinois at spring convocation.

• **Hans T. Clarke,** professor emeritus of biochemistry at Columbia University, was the recipient of an honorary degree from Columbia University.

• **Thaddeus H. Parks,** retired entomologist with the agricultural extension service received an honorary degree from Ohio State University.

• **Francis O. Schmitt,** professor of biology at Massachusetts Institute of Technology received an honorary degree from the University of Chicago.

• **John R. Mayor,** former professor of mathematics and education at the University of Wisconsin, presently AAAS Director of Eductaion, received an honorary degree from Knox College.

• **John S. Gray,** chairman of the department of physiology at Northwestern University, was also a recipient of an honorary degree from Knox College.

• **Louis C. Bierweiler,** curator of botanical collections at Harvard University's Botanical Museum since 1937, retired during this past summer. Mr. Bierweiler has been responsible for the mounting, displaying and repairing of the famous Harvard Collection of glass flowers. This one-of-a-kind collection illustrates the life history of 169 plant families.

• **Franz J. Kallmann,** professor of psychiatric genetics, New York Psychiatric Institute, was the recipient, this year, of an honorary medical degree from the School of Medicine of the University of Turin, Italy.

• **George Darling,** professor of human ecology at Yale University, has been named Director of the Atomic Bomb Casualty Commission. This Commission which is operated by the U. S. National Academy of Sciences in close cooperation with the

Japanese Government has conducted long term studies of Hiroshima and Nagasaki populations to identify any possible biological effects.

• **Guido Pontecorvo,** professor of genetics at the University of Glasgow, Scotland, will deliver the Messenger Lecture at Cornell University in December, 1957.

• **L. W. Miller,** professor of biological sciences at Illinois State Normal University, has accepted the position of chairman of the division of natural sciences at Chico State College, Chico, California.

• **Arthur L. Schipper,** former chairman of the department of biology at the University of Notre Dame, is now the new assistant in the University Relations Division of the Oak Ridge Institute of Nuclear Studies.

• **Fairfield Osborn,** president of the New York Zoological Society, earlier this year received an honorary degree from Princeton University.

• **William L. Laurence,** science editor of the New York Times received an honorary degree from Yeshiva University.

• **Bentley Glass,** professor of biology, Johns Hopkins University, received an honorary degree from Washington College.

• **Carl P. Swanson,** professor of botany at Johns Hopkins University was the recipient of an honorary degree from the University of Massachusetts.

• **Tracy Sonneborn,** professor of zoology at Indiana University, received an honorary degree from Johns Hopkins University.

• **William C. Paddock,** professor of plant pathology at Iowa State University, has been named Director of the Pan-American School of Agriculture at Camorano, Honduras. The original Director of the school, Wilson Popenoe, has been named director emeritus.

• **Max W. Gardner,** professor of plant pathology at the University of California for the past 25 years became professor emeritus July 1, 1957.

• **William P. Mayer,** acting head of the department of biology, University of Southern California at Los Angeles, has been appointed chairman of the department of biology at Wayne State University.

• **J. B. S. Haldane,** professor of biology at University College, London, England, has taken up residency in India. He is accompanied by his wife, Helen Spurway, lecturer in genetics and animal behavior at University College. The husband and wife team will work together in the Indian Statistical Office in Calcutta.

• **A. M. Pappenheimer, Jr.** has accepted the position of professor of biology at Harvard University, effective 1958. Dr. Pappenheimer has been chairman of the Microbiology Department in the College of Medicine, New York University.

• **Albert J. Dernatowiczt** has been appointed chairman of the department of botany, University of Hawaii.

• **Harold St. John,** botanist at the University of Hawaii since 1929 has been appointed to the Wilder Chair of Botany. Dr. St. John will also direct the Harold L. Lyon Arboretum.

• **Eugene P. Odum,** department of zoology at the University of Georgia has been awarded an alumni professorship for his work in the field of ecology.

• **R. Barclay McGhee,** in the same department at the University of Georgia has received the Michael prize for research in the phylogeny of certain flagellated protozoan parasites of insects.

• **Sam R. Aldrich,** Cornell University, has been appointed professor of agronomy extension at the University of Illinois College of Agriculture.

• **Franklin C. McLean,** emeritus professor of skeletal physiology, University of Chicago, is the recipient of an honorary degree from the University of Lund, Sweden.

• **Richard E. Shope,** professor, Rockefeller Institute for Medical Research, New York, received an honorary degree from the University of Giessen, Germany.

• **Julius H. Comroe, Jr.,** chairman of the department of physiology and pharmacology, University of Pennsylvania Graduate School of Medicine, has been named professor of physiology and Director of the new Cardio-vascular Research Institute at the University of California Medical Center, San Francisco. The new Institute will occupy the 13th floor of the Herbert C. Moffitt Hospital, now under construction.

• **Martin H. Moynihan,** of Cambridge, Massachusetts, has been appointed resident naturalist, Smithsonian Institution, Canal Zone Biological Area on Barro Colorado Island. Since 1955 Mr. Moynihan has been a visiting fellow at Cornell University and a research fellow at Harvard University.

• **Arthur Kornberg,** head of the department of microbiology, Washington University Medical School, has accepted an appointment as chairman of the new department of biochemistry at the Stanford University School of Medicine. The appointment will become effective July, 1959.

• **Charles W. Sheppard,** formerly associate director of the biology division, Oak Ridge National Laboratories, has joined the department of physiology, University of Tennessee Medical School as assistant professor.

• **Robert B. Casady,** formerly associate professor of animal industry and zoology at North Carolina State College, has been appointed director of the U. S. Rabbit Experiment Station, Fontana, California, succeeding **George S. Templeton,** who retired after 23 years of service.

• **Cyril L. Comar,** formerly chief of biomedical research at Oak Ridge Institute of Nuclear Studies, has been named director of the new Laboratory of Radiation Biology at the Veterinary College of Cornell University.

• **Walter E. Loomis,** professor of plant physiology at Iowa State College has returned from a year as agricultural advisor with the International Cooperation Administration in the Middle East.

• **Relis B. Brown** is currently visiting associate professor of biology at Vanderbilt University. Dr. Brown was formerly at Lawrence College.

• **Nelson T. Spratt, Jr.,** professor of zoology at the University of Minnesota has been named program director for developmental biology, Division of Biological and Medical Sciences of the National Science Foundation.

• **John L. George** has been named associate curator of mammals at the New York Zoological Park. Dr. George was formerly assistant professor of zoology at Vassar College.

• **Walter P. Taylor** has been named visiting professor of zoology at Southern Illinois University. Until recently Dr. Taylor was a faculty member at Claremont College.

• **Edwin C. Galbreath** has also joined the staff of Southern Illinois University zoology department. Dr. Galbreath was formerly at the University of Kansas Medical School at Lawrence.

• **Paul R. Cannon,** chairman of the department of pathology in the University of Chicago for the past 17 years has retired. As professor emeritus he will continue his work at the University as well as that of chief editor of the American Medical Association's "Archives of Pathology".

• **W. H. Larrimer** has been named director of the Office of the Handbook of Biological Data (National Academy of Sciences-National Research Council). Dr. Larrimer retired from the Forest Service in 1955.

• **Lewie C. Roache** has been appointed chairman of the biology department of South Carolina State College, Orangeburg. Dr. Roache has been a member of the college faculty since 1947.

• **Steven S. Visher,** professor of geography at Indiana University has been appointed research professor.

• **H. M. Armitage,** currently president of the Entomological Society of America, retired recently from State Service after 43 years as agricultural entomologist in California. Mr. Armitage intends to continue with entomological consulting work.

• **Kenneth W. Cooper** has been appointed distinguished research professor of biology at the University of Florida. Dr. Cooper was formerly professor of biology and chairman of the department at the University of Rochester. Dr. Cooper, an outstanding cytogeneticist and investigator will continue his research in those areas at his new post as a member of the staffs of the graduate school and the college of arts and sciences.

• **Thomas J. Walker** has been appointed assistant professor of biological sciences at the University of Florida. Dr. Walker, will teach courses in the university college and the college of agriculture.

• **Daniel M. Cohen** has been appointed interim assistant professor of biological sciences at the University of Florida. Dr. Cohen, an ichthyologist will assist in the maintenance of the ichthyological collections of the Florida State Museum and the department of biology.

Recent deaths among biologists:

Mary A. Bennett, Western Illinois University; professor emeritus of biological sciences and retired head of the Department. 68; Aug. 1957.

Walter Frankenburg, Millersville, Pa.; developer of "homogenized" tobacco leaf. 63; July 1957.

Eloise B. Cram, Bethesda, Md.; former president of American Society of Parasitologists. Feb. 1957.

A. S. Guzman Barron, Chicago, Ill.; professor of biochemistry in the University of Chicago School of Medicine and a trustee of the Marine Biological Laboratories, Woods Hole, Mass. 58; June 1957.

Lawrence F. Lindgren, Lincoln, Neb.; instructor in pathology and bacteriology at the University of Nebraska, associated with the department for 36 years. 67; June 1957.

Henry A. Huston, Kew Gardens, N. Y.; soil chemist who organized and headed the department of agricultural chemistry at Purdue University. 99; May 1957.

Robert P. Jacobson, Shrewsbury, Mass.; senior scientist at the Worchester Foundation for Experimental Biology. 50; May 1957.

Betty Blossom (Elizabeth T. B. Johnson), New York, N. Y.; botanist, writer and former garden editor of *House and Garden*. 48; Sept. 1957.

Elizabeth I. Parsons, Atlanta, Ga.; bacteriologist, head of the general diagnostic bacteriology unit of the laboratory branch of the Communicable Disease Center of the U. S. Public Health Service. 62; Sept. 1957.

Oris P. Dellinger, Pittsburg, Kan.; emeritus dean and retired professor, head of biological sciences department, Kansas St. Teachers College. 79; June 1957.

William Rowan, Edmonton, Alberta, Canada; professor of zoology at the University of Alberta. 65; June 1957.

Ernst A. Bessey, East Lansing, Mich.; emeritus professor of botany at Michigan State University, early in his career professor of botany at Louisiana State University. 80; July 1957.

Robert Chambers, Concord, N. H.; until recently chief of the Laboratory of Experimental Cell Research, Marine Biological Laboratory, Woods Hole, Mass. 75; July 1957.

Henry H. Parke, Sycamore, Ill.; at one time professor at West Virginia State College of Agriculture and assistant state director of agriculture for Illinois. 81; May 1957.

Josephine E. Tilden, Lake Wales, Fla.; emeritus professor of botany, University of Minnesota. 88; May 1957.

Walter A. Jamieson, Indianapolis, Ind.; retired director of the biological research division of Eli Lilly and Co. 67; June 1957.

Alberto F. Thompson, Silver Spring, Md.; head of the National Science Foundation's Office of Scientific Information. 49; June 1957.

Ernst Artschwager, New Mexico Agric. Exper. Station, senior pathologist U.S.D.A. June 1957.

Otto Rahn, Rehoboth Beach, Del., professor of bacteriology, Cornell University, 1927-49, Idaho State College. 76; September 1957.

Karl Schmidt, Homewood, Ill. curator emeritus, Chicago Natural History Museum. 68; September 1957.

From the Societies

• 1958-1959 officers for the **Botanical Society of America** are: President: Frits W. Went; Vice-President: Harry J. Fuller; Treasurer: Aaron J. Sharp, Dept. of Botany, University of Tennessee, Knoxville, Tenn.; Secretary: Harold C. Bold (1955-1959), Dept. of Botany, University of Texas, Austin 12, Texas.

• Officers for the **American Society of Zoologist,** 1958-1959, are: President: H. B. Steinbach; President Elect: V. C. Twitty; Past President: Elmer Butler; Treasurer: Jane Oppenhimer, Bryn Mawr, Bryn Mawr, Pa.; Secretary: Gairdner Moment, Goucher College, Baltimore, Md.; Program Chairman: Sears Crowell, Indiana University.

• Officers for the forthcoming year in the **Society of General Physiologists** are: President: Folke Skoog; Vice President: C. L. Prosser; Treasurer: A. M. Chase, Princeton University; Secretary: Frederick Sherman, Brown University, Providence, R. I.; Council: F. H. Johnson, and K. S. Cole.

• **The Society of Protozoologists** elected the following officers at its recent Stanford University meetings: President: Gordon H. Ball; Vice President: William Balamuth; Treasurer: Daniel M. Lilly, Dept. of Biology, St. John's University, Brooklyn, N. Y.; Secretary: Norman D. Levine, College of Veterinary Medicine, University of Illinois, Urbana; Executive Committee: Lauren C. Gilman. The Society voted to hold its 1958 annual meeting at Indiana University with AIBS.

• **The American Society for Horticultural Sciences,** during its recent annual business meeting, elected the following officers: President: W. T. Pentzer; Vice President: Freeman S. Howlett; Secretary-Treasurer: R. E. Marshall 738 Collingswood Dr., East Lansing, Mich.; Executive Committee: Harry Munger; and Representative to Governing Board of AIBS: Freeman S. Howlett.

At the annual banquet held at the Stanford meeting, the following awards were presented: Alex Laurie Award in Floriculture and Ornamental Horticulture: **C. W. Dunham, C. L. Hamner** and **Sam Asen,** Michigan State University, East Lansing, Mich. Charles G. Woodbury Award in Raw Product Research: **C. T. Poole,** University of Hawaii, Honolulu. Joseph Harvey Gourley Award in Pomology: **C. P. Harley, L. O. Regeimbal** and **H. H. Moon,** U. S. Department of Agriculture, Beltsville, Md. Leonard H. Vaughan Awards: Floriculture and Ornamental Horticulture: **R. J. Downs** and **H. A. Borthwick,** U. S. Department of Agriculture, Beltsville, Md. Vegetable Crops, **R. L. Sawyer** and **S. L. Dallyn,** Cornell University, Long Island Vegetable Research Farm, Riverhead, N. Y.

• **"Forest Land Use in Transition" was the theme of the 57th annual meeting of the Society of American Foresters** held November 10-13 in Syracuse, N. Y. Eleven subject sections of technical papers were presented during the two days of meetings. The three keynote speakers were George A. Garratt, Dean, Yale University School of Forestry, New Haven, Conn.; Ralph W. Marquis, Director, Northeastern Forest Experiment Station, Upper Darby, Pa.; and Edward W. Littlefield, Assistant Director, Division of Lands and Forests, New York State Conservation Department, Albany, N. Y.

• **The Ecological Society of America,** during its annual meeting, at Stanford University in August, elected the following officers. President: Stanley A. Cain; President Elect: Thomas Park; Vice President: Frank Preston; Treasurer: J. S. Dendy, Dept. of Zoology, Alabama Polytechnic Institute, Auburn, Ala.; Secretary: J. F. Reed, Dept. of Botany, University of New Hampshire, Durham, N. H.; Representative to AIBS Governing Board: David E. Davis; Council Members: Lincoln Ellison and Clarence C. Goodnight.

Editor of *Ecology*: (Zoology) LaMont C. Cole; Associate Editors of *Ecology*: (Botany) John Pelton, Philip Whitford and R. R. Humphrey; (Zoology) H. T.

Odum, W. T. Edmundson, N. E. Collias. Associate Editors of *Ecological Monographs*: (Botany) F. H. Bormann, (Zoology) N. G. Hairston. Member of the Committee on Publications: Frank Pitelka; Chairman of the Committe on Applied Ecology: D. D. Allen; Chairman of the Committee on Historical Records: W. A. Dreyer and Chairman of the Committee on Meetings: John H. Davis.

The George Mercer Award of the Ecological Society of America was made to **John J. Christian** of the Naval Medical Research Institute, Bethesda, Md. for his paper "Adrenal and Reproductive Responses to Population Size in Mice from Freely Growing Populations" published in Ecology 37: 258-273, 1956.

The late Karl P. Schmidt was awarded the "Eminent Ecologist Citation" at the Annual Dinner of the Ecological Society at Palo Alto. This award is limited to those outstanding ecologists who have not been honored by the presidency of the society.

The Ecological Society of America will meet with the AAAS at Indianapolis December 26-31, 1957. A. A. Lindsey of Purdue University is the Society's Local Representative.

• **The American Society of Parasitologists** met jointly with the American Society of Tropical Medicine and Hygiene at the Benjamin Franklin Hotel in Philadelphia, Pa., October 30 - November 2, 1957. Over 100 technical papers were presented, and a symposium on "Zoonoses in the Tropics" was a highlight of the meeting.

• **The American Society of Human Genetics** will become a full Member of the American Institute of Biological Sciences on January 1, 1958. The Society has appointed **Karl A. Stiles,** Michigan State University as Representative to the Governing Board of AIBS.

• **The American Society of Professional Biologists** recently elected the following officers: President: Albert Dickman; President Elect: James R. Foster; Past President: Austin W. Morrill, Jr.; Vice Presidents: (western) Hubert Heitman; (central) Harold M. Kaplan; (southern) H. Mac Vandiviere; (northeastern) Carl R. Fellers; Treasurer: Harriett D. Vera; Executive Secretary: Alfred F. Borg, Dept. of Bacteriology, Kansas State College, Manhattan, Kans.

• New officers of the **Association of Southeastern Biologists** are: President: H. K. Wallace; Past-President: George C. Kent; President-Elect: M. E. Gaulden; Vice President: H. H. Hobbs; Secretary: J. C. Dickinson, Jr., Dept. of Biology, University of Florida, Gainesville, Fla.; Treasurer: Arthur W. Jones, University of Tennessee; Editor: V. A. Greulach.

• **The American Phytopathological Society** elected the following officers for 1958: President: Paul R. Miller; President Elect: Glenn S. Pound; Vice President: W. C. Snyder; Treasurer: Saul Rich, Connecticut Agricultural Experiment Station, New Haven 4, Conn.; Secretary: William B. Hewitt, University of California, Davis, Calif.; Editor-in-Chief: E. E. Wilson.

• **The American Bryological Society** elected the following 1958 officers: President: J. W. Thomson; Vice-President: R. L. McGregor; Secretary: Virginia S. Bryan, Duke University, Durham, North Carolina.

A.I.B.S. Reports

• **The AIBS Advisory Committee on Education and Training to the Atomic Energy Commission** met in Washington, September 4-6, to advise the Commission on aspects of its Training Program. 19 proposals for equipment grants were evaluated. This Committee, under the Chairmanship of J. Newell Stannard, University of Rochester, includes Elda E. Anderson, Oak Ridge National Laboratory, Samuel Schenberg, New York City Schools, John A. D. Cooper, Northwestern University, Lincoln Constance, University of California, and Robert MacVicar, Oklahoma State University.

• **The newly constituted AIBS Advisory Committee on Genetics to AEC** met at Iowa State University on October 21 and 22. Persons invited to participate in this meeting included Jay L. Lush, Iowa State College, L. N. Hazel, Iowa State College, J. W. Gowen, Iowa State College, Sewall Wright, University of Wisconsin, W. A. Craft, Iowa State College, Sterling Emerson, California Institute of Technology, C. Nash Herndon, Bowman Gray School of Medicine, and W. L. Russell, Oak Ridge National Laboratory.

• **The AIBS Advisory Committee on Ecology to AEC** has been appointed and is planning a late fall meeting. This committee is composed of Hugh M. Raup, Harvard University, Paul B. Sears, Yale University, Dwight Billings, Duke University, Max E. Britton, ONR, Washington, and William Benninghoff, University of Michigan.

• **The AIBS Advisory Committee on Microbiology to the Office of Naval Research** is planning a fall meeting at the Lerner Marine Laboratory, Bimini, B.W.I., December 3, 4 and 5. Members of this committee are: Emil M. Mrak, University of California; Fred Rasmussen, University of California Medical Center; Alto E. Feller, University of Virginia School of Medicine; J. R. Porter, State University of Iowa; Herbert R. Morgan, University of Rochester; W. D. McElroy, Johns Hopkins University; Norman Conant, Duke University; and Robert W. Stone, Pennsylvania State University.

• **An AIBS Selection Committee** composed of representatives from the Society of American Bacteriologists, American Association of Immunologists and the Society of Industrial Microbiologists has been appointed to review applications for **travel grants to the VII International Congress of Microbiology,** August 1958, in Stockholm, Sweden. The travel grants to be awarded are made possible from funds appropriated by the National Science Foundation. Application blanks are available from the AIBS office. Completed forms must be returned to the AIBS office, *not later than January 1st, 1958.* Any active microbiologists, regardless of his society affiliation, is eligible.

• **An AIBS Selection Committee** composed of representatives from the American Society of Zoologists, American Society of Parasitologists, Society for the Study of Evolution, Society for Systematic Zoology, American Association of Anatomists and the Ecological Society of America has been appointed to review applications for **travel grants to the 15th International Zoological Congress,** to be held in London, England, July 1958. Funds appropriated by the National Science Foundation have made these grants possible. The committee held a preliminary meeting on October 12 in Chicago. Application blanks are available from the AIBS office. Completed forms should be returned to the AIBS, *not later than January 1st, 1958.* Grants will not normally exceed $500.00. Any active zoologists in this country, regardless of his society affiliation is eligible to apply.

• **David G. Frey,** Dept. of Zoology, Indiana University, will serve as chairman of the Local Committee for the 1958 AIBS meetings to be held August 24-27.

• The following scientists have been appointed by their societies to act as **consultants to the National Register of Scientific and Technical Personnel Records Center** at Raleigh, North Carolina: Karl M. Wilbur, Duke University, Society of General Physiologists; Donald P. Costello, University of North Carolina, American Society of Zoologists; John C. Larsh, University of North Carolina, American Society of Parasitologists; Lewis E. Anderson, Duke University, American Bryological Society; H. E. Lehmann, University of North Carolina, Society for Study of Development and Growth; John Routien, Charles Pfizer & Co., Mycological Society of America; C. D. Beers, University of North Carolina, Society of Protozoologists; H. H. Stewart, North Carolina State, American Society of Animal Production; Maurice Whittinghill, University of North Carolina, American Society of Human Genetics; and Boyd Harshbarger, Virginia Polytechnic Institute, Biometric Society (ENAR).

The AIBS portion of the Register has just completed the mailing of 41,552 questionnaires to members of biological soci-

eties. To date 21,514 questionnaires have been returned. Of these 19,000 are eligible for registration and 9,600 have been coded for punching on IBM cards. It is expected that statistical analyses can be started by April 1958 and initial results of these studies published in the June issue of the *AIBS Bulletin*.

• ***America Illustrated*** is a magazine produced by the U. S. Information Service for translation into Russian and distribution in that country on newsstands and through book stores. A forthcoming issue will contain a 2800 word article written by Milton Silverman on the recent AIBS convention at Stanford University. Mr. Silverman, current president of the National Association of Science Writers, covered the meeting for the *San Francisco Chronicle*. His article explains the nature and importance of such national meetings, reports the major scientific contributions and discusses the remarks made by H. B. Glass in his address, "The Responsibilities of Biologists."

• At the recent Stanford meeting, the **AIBS Placement Service** experienced a very successful four-day session. Over 75 positions were registered. Approximately 100 employers were in attendance to interview prospective employees. Over eighty-five applicants registered during the session. Of that number, 70% were scheduled for interviews. Since the Stanford meetings, many employers have written to AIBS expressing their appreciation of the facilities of the Placement Service during the convention. This is only one of the several services of the AIBS Placement Service. The Placement Directories are published in January and June of each year. Based upon past experience, the Service recommends that all June graduates in biology, who may be seeking placement, register for the *January* issue of the Placement Directory. *Deadline for registration is December 31, 1957.* Application forms may be obtained from AIBS. Registration fees for applicants:

Member of an AIBS Member Society	-	$2.00 per listing
Member of an AIBS Affiliated Society	-	$5.00 per listing
Any other biologist	-	$10.00 per listing

Education and Manpower

• **The Fund for the Advancement of Education has announced the establishment of a National Program in the Use of Television in the Public Schools** for which the Fund is making available $986,000. Eight cities and 2 states are taking part in the program: Atlanta, Cincinnati, Detroit, Miami, Norfolk, Oklahoma City, Philadelphia and Witchita, Nebraska and Oklahoma. Grants have been made to the public school authorities in these cities and states on a dollar-for-dollar basis. Regular classroom instruction over television in both elementary and high schools is the basis of the program. Pilot studies have been made by the Fund during the past two years (Hagerstown, Md., St. Louis, Pittsburgh and Chicago). These demonstrations have shown that a teacher can extend his services through the use of television, the pupils learn as much in television classes as with conventional instruction and that television saves a great deal of time for the teacher. The present program will try to find out whether the experiment conducted in a few communities can be extended to most American schools.

• **CBS Television in cooperation with the AAAS will present, about December 29, a one hour program on the scientific advances that have taken place during 1957.** A similar program was prepared in 1956 as part of a series of three telecasts that included a summary of the year's news events and a round table report on world conditions. The 1957 broadcast is being planned to present a balanced picture of important achievements in all fields of science, basic and applied. Preliminary work in the gathering of material has begun. The producers of this show are interested in hearing about scientific advances that could be included appropriately—especially those that are recorded on film. Suggestions may be sent to either Raymond L. Taylor, AAAS, 1515 Massachusetts Avenue, Washington, D. C. or Michael Sklar, CBS Television, 485 Madison Avenue, New York.

• **The National Science Foundation has issued a report on the *Exchange of Foreign and United States Graduate Students in the Sciences, Engineering and Other Fields.*** The data is based on surveys of the Institute of International Education, New York City and of NSF surveys on graduate enrollment. It was found that in 1953-54 approximately 34,000 students from other nations were studying in institutes of higher learning in the United States. This figure is equal to the combined enrollment of foreign students in all universities of Western Europe. In 1946 the total number of foreign students at U. S. colleges and universities never exceeded 10,000. In 1955-56, 36,500 were enrolled. Of these 13,600 or 37 percent were at the graduate level. While the majority of the foreign students in this country are studying at the undergraduate level, U. S. students abroad are predominantly at the graduate level. The foreign students studying in this country are predominantly in the field of natural sciences and engineering while the U. S. students abroad (approximately 9,500) are primarily studying the humanities, chiefly at the graduate level. In 1953-54 the study showed that 50 percent of the foreign students in America were from the following seven countries: Canada, China, India, Philippines, Mexico, Japan and United Kingdom. Since 1920, Asian students have outnumbered Europeans in American institutions. While the majority of all our foreign students have been from Asia, few Americans have gone to Asia to study. Of the Europeans studying in this country the British have been the most numerous. Of Americans studying abroad at both the graduate and undergraduate level approximately 60 percent were in Europe and 30 percent in Canada and Mexico. The European countries chosen by most students were Italy, Switzerland, France and United Kingdom.

Financial support for exchange students was found to come from varying sources. 77 percent of foreign graduate students received all and another 7 percent part of their support from personal or non-governmental sources. Only 16 percent received full support and 7 percent partial support from U. S. or foreign government. Of the American graduate and undergraduate students studying abroad 53 percent were estimated to have some major source of govrenmental or private support, 32 percent received GI benefits, 11 percent U. S. Government scholarships and fellowships, 6 percent were supported by private foundations and universities and 3 to 4 percent were studying on special junior year abroad arrangements. The complete report "Reviews of Data on Research and Development No. 4. Exchange of Foreign and American Graduate Students in the Sciences, Engineering and Other Fields" may be obtained by writing to the National Science Foundation, Washington 25, D. C.

• **A report on the research activities of faculty engaged in scientific work in the U. S. academic institutions has been released by the National Science Foundation.** The survey shows that 70,000 scientists and engineers were employed in 1953-54 by colleges and university. About half of these people were performing research on a full or part-time basis. The survey covered 1,120 institutions capable of performing research in the natural or social sciences. The NSF figures are based on data returned by 980 men in responding institutions. These institutions supported 62,000 faculty members in the natural and social sciences and an estimate of 8,000 was made for non-respondants. 180 of the respondants were large institutions, that is those having graduate schools in the scientific professions. These accounted for 46,500 of the total scientific faculty and for 95 percent of the total research time reported. The scientific field being investigated by the faculty members is also shown in the report. Approximately one third of those performing research were in the physical sciences, one third in the life sciences and another one third in the agricultural and social sciences. The supporting research personnel reported by the large institutions indicate a one to one ratio to the faculty. The report "Faculty Scientific Research Activities at Colleges and Universities, 1953-54" is the No. 6 in the Foundation

Series entitled Reviews of Data on Research and Development. It may be obtained by writing to the National Science Foundation, Washington 25, D. C.

• ***Science World*, a biweekly magazine for high school students,** is now in its second volume. Published by Street & Smith (575 Madison Ave., New York) the magazine carries feature articles written by scientists and science teachers, the occasional science fiction story, sections on the history of science, reports from industry, science in the news, career opportunities, and reviews of movies, books, TV and radio. The editors will welcome contact with biologists who feel they might be able to contribute to the scientific education of high school students by preparing authoritative and interesting articles for *Science World*. The address is: 304 East 45th St., New York 17, N. Y.

• **The U. S. Office of Education has reported that a recent study of high school enrollment in science and mathematics shows that a small increase in the percentage of students has occurred.** This is the first such increase since 1910. Until last fall the percentage has been generally on the decline.

The Office of Education also reports that more and more schools have been offering courses in science and mathematics. The percentage in public high schools providing courses in chemistry or physics to twelfth grade students rose from 77 percent in 1954 to 82 percent last year. Schools offering plane geometry courses to tenth grade students rose from 78 percent to 81 percent. Wide regional variations in enrollment in science and mathematics were found in the study. For example, 90 percent of the tenth grade students in the South Atlantic region study biology as compared to only 65 percent in the Pacific Coast states.

• **The U. S. Office of Education has reported 237,000 scholarships, having a monetary value of $65.7 million were available to undergraduate college students during the school year 1955-56,** compared with only 124,000 scholarships worth approximately 27 million during 1950-51. This survey also indicated that in 1955-56 the 1,562 institutions which enroll more than nine tenths of the college and university students of the country reported some form of student financial aid. Copies of two publications bearing on this subject "Financial Aid for College Students: Undergraduate" and "Financial Aid for College Students: Graduate" may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. ($1.50 respectively).

• **The August 1957 (Vol. 15, No. 5) issue of the National Agricultural Chemical Association's News and Pesticide Review was devoted to "Career Opportunities in Agricultural Chemicals".** Special articles were written by H. M. Armitage, president of the Entomological Society of America, W. B. Ennis, Jr., president of the Weed Society of America and George W. Fischer, president of the American Phytopathological Society. Results of the Association's survey showed that expanding opportunities and attractive salary advancements exist for scientists in the biological sciences. Starting salaries range from $375 to $450 a month for men with BS degrees to $525 to $650 a month for Ph.D.s with reasonably rapid advancement for qualified men up to $10,000 to $15,000 a year. The survey also revealed that more than 50 percent of top administrative personnel in agricultural chemical companies have scientific backgrounds and have come up through the ranks. Demand for scientifically trained men and women is bigger than the supply in industry. This condition is expected to continue for many years to come. Especially needed are entomologists, plant pathologists, plant physiologists, nematologists, agronomists, biochemists and chemical engineers. While the industry is relatively small—about $25,000,000 in sales of basic chemicals in 1956—it has one of the fastest growth rates of any industry at the present time. Sales have increased 640 percent in the past 17 years, compared with a growth of about 550 percent for the entire chemical industry.

• **Eight hundred high school teachers of science and mathematics are currently enrolled in 16 universities, geographically distributed throughout the country in National Science Foundation-sponsored Institutes.** The program, costing approximately 4.25 million has been developed by the Foundation in response to the expressed desire of Congress that the Foundation make a broad frontal attack in meeting the need for improved teaching of science and mathematics for the high school level. Universities participating in the program are as follows: Chicago, Colorado, Harvard, Illinois, Michigan, North Carolina, Ohio State, Oklahoma State, Oregon State, Pennsylvania State, Stanford, Texas, Utah, Virginia, Washington University and Wisconsin. These universities are offering courses for the teachers in biology, chemistry, mathematics and physics, plus some supplementary work in education. Some of the schools are also including courses in the history of science. In addition to regular lectures and laboratory many of the Institutes include seminars and special series of lectures by distinguished scientists and mathematicians. The Foundation is also sponsoring for the first time this fall, a series of 21 In-Service Institutes to be conducted by a number of universities and colleges after hours for teachers in the vicinity.

• **New York University has launched an In-Service Institute for high school science teachers.** Given in cooperation with the New York City Board of Education and made possible by a grant from the Esso Education Foundation the Institute will consist of 27 Saturday morning sessions. On the program are lectures, discussions, field trips and individual laboratory work. One hundred teachers from public, parochial and private schools of the metropolitan area have been selected for the Institute. They have been divided into three sections according to their prime interest. Forty in biology, thirty in physics and thirty in Chemistry. The purpose of the program is to acquaint experienced high school teachers with the latest advancements in the sciences and enable them to utilize the new subject matter in their classes. Leading experts in the various sciences from universities and colleges, industrial firms and research laboratories will conduct the sessions. The Institute is tuition free. In addition each teacher selected receives a $250 stipend to cover personal expenses and the loss of potential income from Saturday employment.

• **The 17th Annual Westinghouse Science Talent Search** has announced that a total of $34,250 will be available for awards and scholarships to high school seniors throughout the country. The amount to be awarded this year will more than triple the $11,000 distributed each year in the past. Last year more than 20,000 students entered the contest. From the thousands of applicants the judges select the 40 national winners, who then attend the 5 day Science Talent Institute in Washington, D. C. and vie for the 5 scholarships. The entire trip is free to the forty students. During the Science Talent Institute the winners have an opportunity to exhibit their research projects, participate in discussions with many of the nation's leading scientists and visit government and private research centers. The grand scholarship is $7,500. Four other scholarships range in value from $6,000 to $3,000. Each of the remaining 35 winners receive an award of $250. In addition, 160 students in the contest who display "excellent promise of becoming creative scientists" will be sent Honorable Mention Citations. To comply with the rules all contestants must complete a two and a half hours science aptitude examination and write a report on "My Scientific Project". Personal and scholastic records are required from the entrant's school, either public, private or denominational, within the continental limits of the United States. Examination will take place at the individual's own school beginning December 1st and all entries must be submitted by midnight, December 27, 1957. Unlike many scholarship competitions, Science Talent Search has no rule prohibiting winners from accepting scholarships from other sources as well. This permits them to hold scholarships from a college or university or industry without forfeiting their Westinghouse scholarship. The Westinghouse Educational Foundation, supported by the Westinghouse Electric Corporation, provides the scholarships and makes the Science Talent Search financially possible.

Science Service, a nonprofit organization for the popularization of science, conducts the Science Talent Search through the Science Clubs of America.

• **Earlier this year the first annual report of the National Merit Scholarship Corporation was released.** This Corporation is "an independent non-profit organization combining the largest independently supported scholarship program ever undertaken together with the mechanisms designed to assist business enterprises which are contemplating aid to education. The Ford Foundation and the Carnegie Corporation of New York have undertaken to finance this activity for a ten year period by grants totaling 2.5 million for its administrative expenses. For a basic continuing scholarship program the Ford Foundation has appropriated 10 million payable at the rate of 1 million a year for 10 years and is prepared to finance additional scholarships up to the total of 8 million, to match scholarships which may be contributed from industry. The major underlying purposes of these grants are twofold: to discover throughout the country the ablest youth and to make it possible for these talented young people to get a college education regardless of their financial situation; and to make it easier for business enterprises and other organizations to contribute effectively to the support of higher education by the scholarship route. A further purpose is to provide in one organization a single national talent search and an open-ended flexible scholarship program that will reduce wasteful duplication of appropriation and will at the same time meet the interest and purposes of the donors". Some 36 firms are already participating in the activities of NMSC and other firms who are interested in helping to provide scholarship funds toward these students are invited to write National Merit Scholarship Cooperation, 1580 Sherman Ave., Evanston, Ill.

• **The National Academy of Sciences-National Research Council created an Advisory Board on Education in the spring of 1956.** The Board, besides serving as a principle agent of the Academy and Research Council in broad matters relating to education in the sciences, was planned to stimulate interest and encourage activity of all branches of science and engineering, to provide leadership in establishing scholarly criterion of science education, to promote common planning between professional organizations and societies, to join with other organizations and institutions in strengthening and maintaining the subject matter preparation of teachers at all levels of science education, to anticipate future national requirements for scientific manpower, to investigate and work toward the improvement of aids and to provide bridges between science and the other learned professions in the matter of education.

Four recent activities of the Advisory Board are: (1) *Southern California Industry-Education Conference* held July 7-13, 1957. Over one hundred educators and representatives of industry in the Southern California area met for a week to consider means of improving educational opportunities in science for students and ways of attracting and holding good teachers in the secondary schools and colleges. As a result of their recommendations a new southern California Industry Educational Council was formed, five members representing industry education were appointed and an executive secretary chosen. Successful programs in the area and in other parts of the country will be described in a monthly newsletter. New programs will be encouraged. Information on summer jobs will be made available, regional workshops will be set up and a speakers and press bureau will carry on active public information programs for civic and other organizations. The second annual California Industry-Education Conference is planned for July 1958. (2) *Mathematics Film Evaluation Board.* Films for mathematics were chosen for first consideration both because mathematics underlies all fields of science and because since there are fewer teaching films in mathematics than in other subjects more nearly comprehensive examinations and reports could be made. Meeting at Pennsylvania State University during August 1957 the Board, comprised of 6 mathematicians, reviewed 35 films covering the whole educational range from primary grade arithmetic to college calculus. The evalaution board felt that the new medium offered great possibilities for teaching, especially in the clarity of illustration. Animated drawings were particularly successful. New ways of presenting mathematical subjects should be encouraged. Pupils who respond poorly to conventional teaching could be challenged by stimulating films. Another advantage of the film is that it can bring the best and most expert presentation to all schools. The use of films has a number of disadvantages however. Loss of good pupil-teacher relationship is one of the greatest. The student does not have opportunity to ask questions as they may arise and the teacher is unable to clarify possible misconception. Extension of such evaluative studies to other fields of science is now under consideration. (3) *Calculus Course by Color Television.* The first lecture is a new course given by R. A. Good, University of Maryland and was given October 15, 1957. This course is unique in that it is being given over closed circuit television to teachers of science and mathematics in the Washington, D. C. area. Those who complete the course will receive graduate credit. A grant from the Fund for the Advancement of Education has been received to support an evaluation of this experimental course, through the use of the recorded color cinescopes.

(4) *"Conquest" Television Science Series.* The Advisory Board on Education is cooperating with the Columbia Broadcasting System in the planning and preparation of the new science series "Conquest". This program will be broadcast throughout the 1957 series. The first program will be Sunday, December 1, 1957.

For Biology Instructors, Students, Naturalists, Ornithologists . . .

- **Revised Edition**
- **Adaptable Exercises**
- **Suggested Field Trips**
- **Fundamental Techniques**

Workbook for Field Biology and Ecology

By ALLEN H. BENTON and WILLIAM E. WERNER, JR.

Eight sections of study cover taxonomy, field techniques, terrestrial and aquatic communities and succession, population and behavior studies, projects for field study, and selected literature. Exercises and field trips are adaptable to any area in North America. The book is effectively used in beginning courses in natural history, advanced ecology and field biology classes, and nature study.

Copyright 1957; 5½ x 8½ size; 277 pages; photo offset; spiral bound. $2.75.

BURGESS PUBLISHING COMPANY

426 South Sixth Street • Minneapolis 15, Minn.

Letters to the Editor

July 30, 1957

Most biologists would agree with the letter from Dr. A. S. Leopold (AIBS Bulletin, June, 1957). However, a supplement is desirable.

The majority of doctorate recipients in biology accept positions in colleges or universities. Typically, the biologists' first few years in a teaching position involve a frantic effort to learn a new profession, education, while hopefully using odd moments to produce research. These first critical years often determine whether or not he will become a productive scholar, the task for which he was trained. The failure of many of our Ph.D. recipients to continue the production of new knowledge clearly indicates serious discrepancies—either in their training or in the situations they encounter.

The major discrepancies are in the graduate programs that rarely prepare the student for a position in the field of higher education. Our training should provide knowledge that will permit the new teacher to more easily meet his obligations as a faculty member, defend his rights, and create time for research. Criticism of graduate programs that manufacture research specialists and ignore the fact that their product may become a college or university teacher has been repeatedly stressed since the 1920's.

Our graduate schools are not producing men cognizant of the challenges they will face in the college or university. Our graduate departments have attempted to avoid any smattering of "professional education." This proper effort to avoid the encroachment of formal education courses has, unfortunately, led to the obliteration of training for teaching positions.

The successful university or college biologist can not divorce himself from the field of higher education. He must be concerned with two great fields, biology and higher education. As a teacher he must be concerned with the problems of teaching. As a faculty member he must be prepared to participate in the resolution of problems involving curriculums, budgets, counseling, and academic traditions. As a scientist he should gain satisfaction from the advancing of knowledge. As an educator he must represent the role of his science in education and the community. The failure of our college and university biologists to contribute significantly to the improvement of science teaching in the secondary schools is a reflection of the failure of the graduate school to make their students cognizant of educational problems and the role of their science in our society.

How can the graduate department better train men for work in higher education? Certainly more formal training is not the answer. The student must be stimulated to the desire for knowledge, to question authority, to debate. The student must learn to do research, to write, to critically assess the writings of his colleagues. He should have the stimulus of publishing his own work. He should gain an appreciation of good teaching; he must not be taught that teaching serves only to provide "bread and butter" and is the drudgery that dulls him for creative work. He must gain teaching experience. He must be given knowledge of the practical aspects of college and university life—the tenure system, salary schedules, administrative procedures, teaching standards, testing procedures, etc. He must have knowledge of current affairs and national organizations in science and education.

The department training biologists to the doctorate level should consider the situation described by Reed (1952). "Colleges hire Ph.D.'s in the hope of getting good teachers; universities hire Ph.D.'s in the hope of obtaining outstanding researchers; government and industry hire Ph.D.'s in the hope of getting good technicians or researchers." The colleges are frequently disappointed and the Ph.D. they employ is frustrated and bitter. The college expects a teacher, has a situation designed for a teacher, but often receives a "leftover" from a group of specialists trained and indoctrinated solely for research.

Our graduate departments produce men who meet, after much initial difficulty, their obligations as teachers and researchers in our colleges and universities. But with a small effort, we can better equip these men for teaching positions. We can provide understanding and information that will permit the new teacher to satisfy his initial challenges more readily and thus retain time for scholarly work.

There are four major deficiencies in the doctorate training of biologists. a. They have no practical knowledge of the problems they must face in a college or university position. b. They are not prepared to teach. c. They have but scant knowledge of national affairs and organizations in biology or education. d. They have no appreciation for the extent of the literature of biology and only vague impressions of bibliographic research procedures. These gaps can readily be closed without detracting from the primary goal of producing the person described by Leopold as "a man with the mind educated in the pathways of research."

The Department of Zoology of Tulane University has found that a seminar devoted to the professional aspects of higher education contributes much toward acquainting the graduate student with educational problems and informing him of national activities. The emphasis is placed on discussion of current publications by scientists and educators. The debates in these seminars are often lively. The students accepting teaching positions have reported that this seminar was one of their most profitable experiences as graduate students.

The following is a typical group of publications reviewed in the seminar during 1956-57: "Baccalaureate Origins of Science Doctorates Awarded in the United States, 1936-1950," Publ. 382, NAS-NRC.; "Maintaining and Improving the Quality of Instruction," Journal of Higher Education, May, 1956; "Encouraging Scientific Talent," College Entrance Examination Board, 1956; "Scientific Writing," Harcourt, Brace and Company, 1953; "The Crisis in Teaching," The Atlantic, September, 1956; "Faculty Rights and Obligation," Teachers College, Columbia, 1957; "Government and Science," N. Y. University Press, 1954; "Teaching Salaries Then and Now," The Fund for the Advancement of Education, 1956; "Age and Achievement," Princeton University Press, 1953; "After High School—What?", University of Minnesota Press; "Scientific Books, Libraries and Collectors," The Library Association, 1954; "Science: the President's New Power," Saturday Review, 1957; "The Relationships Between Liberal and Professional Education," The Educational Record, October, 1956.

The discussion of such publications leads the graduate student to an awareness of problems in science and general education and gives him confidence in his ability to think about them. He is much better prepared to meet his responsibilities, and he is better able to defend the need for research.

The seminar instruction does not detract from the established graduate instruction and does stimulate the student to improve his ability as a scholar. A balanced selection of topics for discussion aids much in improving the student's knowledge of national affairs in science, in providing information about the responsibilities of a faculty member, and in acquainting him with the literature of biology.

FRED R. CAGLE, *Chairman*
Conference of Biological Editors,
Tulane University, New Orleans, La.

Are you planning now to attend . . . .

1958 AIBS MEETINGS

Indiana University, Bloomington **August 24-28, 1958**

Biology Library

One copy of each publication submitted for listing should be sent to the Editor, AIBS Bulletin, 2000 P Street, N.W., Washington 6, D. C. Only books published within a year of receipt will be reviewed. Books marked with an ★ are those published by Bulletin advertisers.

ANIMAL SCIENCES

Some Common Australian Birds. ALAN and SHIRLEY BELL. 210 pgs., 102 illus. Oxford University Press, 114 Fifth Ave., New York, N. Y. (1956) $4.60

This attractive little book is directed to the casual observer of natural history in Australia, seeking to widen his acquaintance with the bird life of that country. One hundred and ten of the most common or conspicuous species have been selected and arranged for convenience in two main groups according to size. The principle characteristics of plumage, voice and "personality" of each of these species is presented in a readable sketch on a page facing an attractive color portrait. The book has limited value for the professional or even for the systematic amateur, but should perform a service in arousing the interest and appreciation of the general public in bird life. *John T. Emlen, University of Wisconsin.*

A Population Study of Penguins. L. E. RICHDALE. 195 pgs., illus. Oxford University Press, 114 Fifth Ave., New York, N. Y. (1957) $6.75

This is the second book resulting from the author's 18-year study of the yellow-eyed penguin, mainly on the Otago Peninsula, New Zealand. The earlier book, published by the University of Kansas Press in 1951, dealt mainly with sexual behaviour. The general content of the present book is adequately shown by ten chapter headings including such titles as: The Pair-Bond, Chick Period, Juveniles, The Penguin Community, and Moulting Season. The author has collected and collated a truly astonishing amount of material—perhaps only a little less astonishing when one reads that he visited the breeding areas 1,318 times. As is painfully known to everyone who has tried, it is not easy to sift masses of life history data for significant items and generalizations, and even more difficult, to present the results in a concise, readable style. In both these tasks Richdale has succeeded better than most and has improved over his own earlier book. He also deserves congratulations for carefully defining his terms at the outset. Some of the terms, such as "keeping company", "unemployed", "divorce" and "separation" have connotations concerning the behavior of the human species. It will be an apathetic reader indeed who does not occasionally find himself drawing some comparisons. Wisely, Richdale leaves such exercises to the reader. Like the first book, Richdale's second is not a volume for casual reading, but is a benchmark in science. *Keith R. Kelson, National Science Foundation, Washington, D. C.*

Audubon Western Bird Guide. RICHARD H. POUGH. 316 pgs., illus. Doubleday and Co., Inc., Garden City, N. Y. (1957)

Representing the third in a series of "guides" done by the same author under the auspices of the National Audubon Society, those already familiar with the land- and water-bird guides to the birds of Eastern North America will welcome the appearance of what presumably represents the completion of the series. It does seem unfortunate that persons interested in western birds alone will be forced to purchase the other two volumes if they want a complete guide to the western avifauna. The omission of descriptions of all forms which have been treated in earlier volumes seems unwarranted. These books were designed as field guides and yet it will be a physical impossibility to carry all three volumes into the field. Certainly three pocketsful of books will discourage many bird watchers who would otherwise find it very valuable. Don Eckleberry has supplied excellent full color illustrations of many of the species. These are augmented by numerous pen and ink sketches by Eckleberry and Terry M. Short. Two hundred and three species are described and information is given concerning voice, nest and range. The remaining 411 species (having been given full treatment in one of the earlier volumes) have data on range only. Mr. Pough has provided an attractive addition to the already voluminous library of contemporary ornithological publications. *J. C. Dickinson, Jr., University of Florida.*

General and Applied Entomology. V. A. LITTLE. 543 pgs., 326 illus. Harper and Brothers, 49 East 33rd St., New York 16, N. Y. (1957) $7.00

As the title suggests, this book is designed to be a beginning text in entomology with a strong applied slant. In his preface the author ranks his priorities as taxonomy and biology first, applied phases next and morphology and physiology "limited to only a working knowledge." The emphasis may easily be judged by the less than nine pages each of Chapters 4 and 8 devoted to internal anatomy and physiology and to classification, respectively. There are keys to the orders and common families and these, together with drawings or good photographs of some 250 species, constitute most of the taxonomy. The language is usually appropriately cautious but when, as on p. 467, he implies a "reason" for certain insect activities this may be difficult to sustain. A blooper on p. 468 refers to painful stings of insects that have none; it is the bite instead. An 8-page glossary and a selected bibliography of similar length are useful features.

Throughout the book control methods are detailed and this should make it a useful manual for the county agricultural agent and pest control operator. It is indeed the control measures for common insect pests, particularly of the South, that is the outstanding feature. *Neal Weber, Swarthmore College.*

Primates, III. Pithecoidea, Platyrrhini (Families Hapalidae and Callimiconidae). W. C. OSMAN HILL. 354 pgs., illus. Interscience Publishers, 250 Fifth Ave., New York, N. Y. (1957)

In his third primate monograph, Dr. Hill pays special attention to the marmosets, reviewing the hitherto little known paleontological history of the group. Hapalidae, rather than Callithricidae, is adopted for the family name, since evidence is now at hand to transfer *Callithrix* to a genus of the cebid subfamily Pitheciinae. After completion of the manuscript, Hill examined fresh material of *Callimico*, and subsequently placed it in a subfamily Callimiconinae of the Hapalidae. Usage of the term Pithecoidea rather than Anthropoidea is defended. The external features, skeletal, dentition, myology, splanchnology, digestive, neurology, sense organs, development, behavioral characteristics, parasitology, distribution and taxonomy are adequately treated for the 10 genera and 37 species included. Excellent line drawings and photographs serve to supplement the text. This volume, like its predecessors, will be of inestimable value to the anthropologist and mammalogist alike. *W. J. Hamilton, Jr., Cornell University.*

The Beginnings of Embryonic Development. Edited by A. TYLER, R. C. VON BORSTEL, and C. B. METZ. 400 pgs., illus. American Association for the Advance of Science, 1515 Massachusetts Ave., Washington, D. C. (1957) $7.50

This volume is based upon a symposium on "Formation and Early Development of the Embryo," held in 1955 at the Atlanta meeting of the AAAS. Since only seven of the papers were presented, the volume was expanded and broadened by the inclusion of six added papers, four of which are by Europeans. There is no marked degree of integration of the thirteen papers into a unified view of the field of early development. They represent isolated contributions or, as stated in the preface (p. iv), "a selected sample—of descriptive and experimental work on the biological and chemical levels". Some are concerned chiefly with presenting unpublished work, others constitute reviews of limited aspects of the field.

The component papers include (1) original work by W. S. Vincent on the RNA of the nucleoli of starfish oocytes; (2) an excellent review by C. B. Metz of the present status of the fertilizin theory; (3) discussion of recent work on the physiology of the mammalian spermatozoon by C. R. Austin and M. W. H. Bishop; and another (4) on mammalian fertilization by M. C. Chang; (5) a report by A. L. and

L. H. Colwin on acrosome filament formation in various forms; (6) a paper by A. Monroy on protein changes in the sea urchin egg; (7) a contribution by R. C. von Borstel on nucleocytoplasmic relations in early insect development; (8) a review by H. E. Lehman of nuclear transplantation; (9) a study by J. R. Gregg of morphogenesis and metabolism of certain arrested amphibian hybrids; (10) observations by J. R. Shaver on cytoplasmic particles (mitochondria?) in the early development of the sea urchin; and reviews covering (11) experimental conditions, especially chemical, affecting early determination, by S. Ranzi; (12) the role of certain enzymes in ascidian development, by G. Reverberi; and (13) the immunological approach, by A. Tyler. *Donald P. Costello, University of North Carolina.*

Freshwater Fishery Biology. KARL F. LAGLER. 421 pgs., illus. Wm. C. Brown and Co., Dubuque, Iowa. (2nd edition, 1956)

This attractive and well illustrated book is longer by 61 pages than the first edition published in 1952. The checklist and economic classification of common and representative freshwater fishes of North American north of Mexico, which constituted most of chapter two in the first edition, now appears as Appendix F and, in its place, is a 43 page section on the 33 families with life history accounts and descriptions of representative fishes. The other 24 chapters have much less extensive revisions but contain many new references which in several instances are conveniently subdivided by topics. One entire chapter is devoted to the literature of fish and fisheries. The first and largest part of the book (15 chapters) deals with natural history and ecology, classification and identification, anatomy, embryology, life history, food, age and growth, population studies, pathology, and pollution. Chapters 16 and 17 discuss the role of laws and fish culture (including stocking) as related to management. Chapters 20 and 22 deal with lake improvement and stream improvement respectively, and Chapter 23 treats the creation of new fishing waters. A third portion of the book (Chapters 18, 19 and 21) describes methods employed in topographical, physical, chemical and biological surveys of lakes, ponds, impoundments, and streams. The final two chapters deal with freshwater commercial and recreational fisheries. Study programs are suggested for each chapter and much information useful to students and research workers is included in 6 appendices occupying 57 pages. Although an outgrowth of a 1947 publication, *Studies in Freshwater Fishery Biology*, used largely as a laboratory manual, the present volume provides a text and useful reference for students, teachers, technicians, fisherman and fish culturists. Dr. Lagler is Chairman of the Department of Fisheries, School of Natural Resources, University of Michigan. *D. L. Leedy, U. S. Fish and Wildlife Service, Washington, D. C.*

★Development of Vertebrates. EMIL WITSCHI. 588 pgs., 370 illus. W. B. Saunders and Company, West Washington Square, Philadelphia, Pa. (1956) $8.50

In the Preface the author states that this text is primarily for premedical students and zoology majors who have had a course in general biology. The aim of the text is "The presentation of developmental concepts on an advanced basis, while introducing the subject matter of vertebrate embryology." In accomplishing this the author combines experimental aspects of modern embryology with the basic descriptive morphology, presenting sufficient descriptions of research methods for the understanding of various aspects of embryological investigations. Developmental problems and the present status of our ideas concerning them are presented. In addition to the emphasis on experimental embryology, the text differs from others in the handling of material dealing with gametogenesis, the Amphibia and the birds. This material reflects the interests and work of the author. These sections are more detailed than what may be considered usual and consequently contain descriptive and experimental information not available in other texts.

In some respects this reviewer feels that the text might be better suited for students more advanced than those cited by the authors. This is based on the impression that the excellent job of correlating embryology with anatomy requires the student to have a more extensive vocabulary and appreciation of zoology than is gained in one course in general biology. The feeling is given that frequently the format of the text, the sometimes brief technical introductions to sections, and the constant cross references within the content, while raising the level, might be better suited for use by more mature students. *John R. Harrison, Miami University.*

The Faunal Connections Between Europe and North America. CARL H. LINDROTH. 344 pgs., illus. John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y. (1957) $15.00

The first 110 pages of this interesting work are taken up with an annotated list of land and freshwater animal species common to Europe and North America. The list is specially selected by being limited to groups which are well known as to taxonomy and distribution and excludes a series of special categories, such as those intentionally introduced, those which have been reported as immigrants but which appear not to have become established, etc. Aside from an interesting 1-page summary of this list, little is done with the data until the latter part of the work where reference is made to special instances.

The book is divided into three chapters, the second of which deals with the human transport of animals across the North Atlantic. Here we are on eminently solid ground for the chapter is largely based on an extended study of the Carabid beetles, concerning which the author is an authority. His account of the extent of early inballast voyages under sail from England to Newfoundland and Nova Scotia is the best summary of this important factor in chance introduction which this reviewer has yet seen. The included remarks on the origins of weeds and other organisms regularly inhabiting the "cultural steppes" (and therefore more likely to be introduced) are brief but pertinent. And the extended explanations of why so many more organisms have been introduced from east to west across the Atlantic, rather than from America to Europe, are sound.

The last part of the work deals with the true, pre-human relationship between the palaearctic and nearctic faunas. It would seem that little new could be presented on this oft-warmed subject, but the author manages to liven his discussion with considerable reference to the distributional antics of his favorite beetles, both flying and flightless types. In various instances, however, this reviewer wished that the author had taken into account the possible distributional patterns as influenced by the well authenticated post-Wisconsin xerothermic period; its effect on the present distribution of the boreal biota may have been profound, and its recentness makes it all the more pertinent.

To achieve the distributions which he sees, Lindroth advocates accepting a Pleistocene land-bridge from Europe via Scotland and Iceland to Greenland. To him (and other students of the problem) the real biotic break between Europe and America comes at Davis Strait, between Greenland and Baffin Island; it is argued that organisms which bridge this gap have ready means of passing the barrier. Wegener's concept of continental drift is not necessary to the author's ideas of boreal distribution, and so he rejects the theory. One can but hope that continental drift will not too soon pass into Limbo; for biogeographers it has sparked many a lively discussion. *W. H. Camp, University of Connecticut.*

PLANT SCIENCES

The Growth of Leaves. F. L. MILTHORPE. 223 pgs., illus. Butterworths Publications, Ltd., 88 Kingsway, London, W. C. 2, England. (1957)

This book represents the proceedings of the Third Easter School in Agricultural Science, University of Nottingham, 1956. Accepting the principle that agricultural yield is dependent more upon the total photosynthetic surface than upon the rate of carbon assimilation itself, the organizers of the School devised a program consisting of "General aspects of growth and differentiation" (3 papers), "Initiation of leaf primordia" (3 papers), "Leaf expansion" (4 papers), and "Influence of external forces on leaf growth" (4 papers). Much of the basic information presented had been published previously, but new data are introduced in the relatively short

talks given by the various speakers. The discussions held after each paper are included and perhaps can be characterized by the thoughtful skepticism of the questioners. Brief descriptions of 14 demonstrations conclude the book. For those unable to keep up with the pertinent original literature, this small book contains a wide variety of information. This reviewer was most impressed by the paper on "Etiolation phenomena and leaf expansion" by W. T. Williams, a reaction seemingly shared by the participants, for the longest discussion followed this paper. *Vernon I. Cheadle, University of California.*

Marine Algae of the Northeastern Coast of North America. WILLIAM RANDOLPH TAYLOR. 509 pgs., illus. The University of Michigan Press, Ann Arbor, Michigan (1957) $12.50

The revised edition of Professor Taylor's comprehensive summary of the taxonomy of the algea of the northeastern coast is a publication which will be indispensable to those who require information on the algal flora of that region. The book contains an introductory section in which such topics as geographical distribution, algal habitats, methods of collection and preservation and a historical survey of early studies of the algae of the region are discussed. This is followed by a most convenient systematic listing of the species included in the volume. 167 pages of text are devoted to treatment of the diagnostic attributes of the orders, families, genera and species of the marine algae of the region covered. The specific descriptions are supplemented by notes on geographic distribution and habitat and by references to the history of the taxon. A majority of species are well illustrated in the sixty plates as in the first edition. Keys to the orders, families, genera and species of the several algal classes are provided. In this second edition, the classification has been revised in the light of recent researches. This is reflected, especially, in the treatment of *Ectocarpus* and *Acrochaetium* and in the increased listings of species of *Vaucheria*. In his statement of "Purposes and Limitations" the author writes: "This book is planned to relieve the algal student from considering scattered sources of information in the older literature in making routine determinations. It is not itself a final authority, for only the original specimens and descriptions underlying the various species names can so qualify." A bibliography of relevant literature also is included. Based as it is on more than twenty-five seasons of intensive study of the algae of the northeastern coast of North America as well as on the author's extensive experience with marine algae of other parts of the world, the present volume will long continue, as has the first edition since 1937, to represent an authoritative handbook of the marine algae of the northeastern coast of this continent. *Harold C. Bold, University of Texas.*

★Principles of Plant Pathology. E. C. STAKMAN and J. GEORGE HARRAR. 581 pgs., illus. Ronald Press Co., 15 East 26th St., New York, N. Y. (1957) $8.00

The book is a discussion of the problems and principles involved in protecting the health of domestic plants; principally those of greatest significance as food crops on a world-wide basis and with the diseases which are limiting factors in their production. The arrangement of chapter titles and the presentation of subject matter under the 18 chapters present general plant pathology in a stimulating and thought provoking manner, distinctly different from previous texts. While the array of pathogens presented and discussed, includes those generally used in a beginning course, they are presented under the several headings of principles, problems, and host rather than in the generally adapted mycological sequence. Certainly both the teacher adopting the text and the students using it will be introduced to a compendium of facts lucidly written in a new order. The international scope of the subject matter and illustrations used reflect the wide experience of the authors in the development of agriculture on a world-wide basis. The combined chapter-figure numbering of the well selected illustrations and the omission of page references in the list of "Principal Pathogens Cited in Text", especially since many are not included in the "Index", are perhaps questionable book construction inovations and omissions. Its general acceptance as a text in principles of plant pathology depends largely upon the concepts of the teacher in the orientation and organization of the course. The mass of data and information pertaining to agricultural plants and plant patohlogy on an international basis, well organized and skillfully presented, assures the volume a place in the reference and assigned reading lists for all courses in plant pathology. *James G. Dickson, University of Wisconsin.*

The Physiology of Reproduction in Fungi. LILIAN E. HAWKER. 128 pgs. Cambridge University Press, 32 E. 57th St., New York, N. Y. (1957) $3.00

The literature on the physiology of reproduction in fungi has become so extensive that a short and readable summary has been much needed. Miss Hawker has presented such a summary in 107 pages. The first chapter discusses and defines the various types of reproduction in fungi, followed by a chapter on the growth and morphology of various types of spores, spore bearing structures and accessory reproductive bodies. The next three chapters discuss the effect of temperature, water, aeration, light, nutrition and other environmental factors on the formation of various types of spores, sclerotia and other non-sexual reproductive bodies.

One of the most interesting chapters is on the physiology of sex in fungi in which the author has gleaned the more significant discoveries as in genetics and hormonal control and summarized these in relatively simple language. The final chapter discusses too briefly some of the factors influencing the reproduction of fungi in the natural habitat. This valuable book, by one whose main researches have been in the physiology of fungi, is more than a summary of what has been done, since in many places new suggestions are given for future research. A bibliography of about 300 titles should be a great help to the reader who wishes to pursue the subject further. *John N. Couch, University of North Carolina.*

Plant Diseases Due to Bacteria. W. J. DOWSON. 225 pgs., illus. Cambridge University Press, 32 East 57th St., New York 22, N. Y. (1957) $6.50

An excellent text for the undergraduate or beginning graduate student, this second edition is enlarged and more complete than the first edition. It is a text book type of publication that brings together a great deal of scattered, valuable and pertinent information on plant diseases caused by bacteria. One-third of the 200 page book is devoted to media, classification and nomenclature, methods of investigation, staining techniques, and general characteristics of bacteria and their identification. Two-thirds of the text is devoted to diseases caused by bacteria, with each being covered by such topics as General Information on the Disease, Symptoms, Etiology, and a minimum amount of information on Control. There are a number of black and white, glossy photographs on some very common bacterial diseases. It is a pleasure to have an abundance of the scattered references on plant bacterial diseases brought together under one cover. The book should stimulate students and others to search deeper into references on these important diseases and plant pathogens. *Thomas Sproston, University of Vermont.*

★Plant Pathology. JOHN CHARLES WALKER. 708 pgs., illus. McGraw-Hill Book Co., 330 West 42nd St., New York, N. Y. (2nd edition, 1957) $10.00

There is a growing concern over the shortage of plant pathologists in the land and this is particularly true of the plant pathologist with a dynamic approach to his subject. How is the student with a dynamic mind to be attracted by plant pathology as a profession when his introduction to the subject is a cataloguing of knowledge? The general course in plant pathology is coming more and more to be offered to graduate students. At this stage they are ready for a sophisticated approach, a treatment that stimulates the imagination. De Kruif's two books "Microbe Hunters" and "Hunger Fighters" well illustrate that scientific reading can be stimulating while it presents the necessary factual information to the uninitiated. Large's "Advance of the Fungi" constantly plunges the reader into the controversies that prevailed while evidence was being weighed and principles established. It is time that

general textbooks in plant pathology became stimulating to students; this is one medium for attracting minds capable of high levels of integration.

The first edition of Walker's "Plant Pathology" has been widely accepted and has become one of the several standard texts in the field. Like a number of others on general plant pathology, this text catalogues about a hundred diseases and details for each of the symptoms of the disease, the causal organism, the disease cycle and methods of control. The documentation of this information fills about four-fifths of the book. In this section, there are but few changes between the first and second editions. As in the first edition, diseases are classed in terms of the taxonomic position of the pathogen, a method unfortunately used in most tests. The chapter on virus diseases, while offering the student much useful information, sadly neglects the many contributions to virology that have recently come from abroad.

The remainder of the book deals with physiological aspects of the diseased plant, with host-parasite interactions and with principles of disease control. This section has been thoroughly revised, though the chapter on plant protection is probably least current. Even though revised, the approach tends to be rather formally straightforward and does not reflect the atmosphere of discovery that stimulates the student to explore the unknown or unresolved.

In the reviewer's opinion, it might be more stimulating to the student to set the stage with a discussion of the principles illustrating the scientific method in action and then to exemplify these principles with a discussion of specific disease, as was done in Duggar's text many years ago. By this organization, the student might be encouraged to generalize rather than to particularize. The author has been caught in his own organizational scheme. Thus the spread of diseases, the generalizations concerning vectors and their control have become lost by being stated repeatedly in the discussions of specific diseases and nowhere is there a place for these generalizations in the last section of the book. The reviewer hastens to state that the author is not alone in his view of plant pathology. But in recent years the plant pathologist has begun to generalize without fear of error, rather than to aim at particularization alone, and he has improved the stature of his profession thereby. Surely the beginning student would not be injured by such an approach! *A. E. Dimond, Connecticut Agricultural Experiment Station.*

★Biology and Control of the Smut Fungi. GEORGE W. FISCHER and CHARLES S. HOLTON. 622 pgs., illus. Ronald Press Co., 15 East 26th St., New York 10, N. Y. (1957) $10.00

The 13 chapters summarize in considerable detail the major aspects of the biology and the control of the smut fungi. The emphasis throughout is upon living fungi rather than upon "herbarium mycology", and the authors have drawn widely upon their own extensive background of work with these fungi and the diseases they cause. Nomenclature and Phylogeny, for example, are covered in 5 pgs. (which seems ample) while 37 pgs. are devoted to Hybridization, Mutation and Genetics, and 19 pgs. to Physiologic Specialization; both of the later contain modern concepts and principles of wide biological significance that have been derived mainly from studies of the smut fungi. The chapter on Morphology, Taxonomy and Symptomatology (73 pgs.) includes a key to the genera of the Ustilaginales, a synopsis of the genera, and a host family register of the smut fungi all of which should be very useful. In general, the book summarizes a wealth of information on the smut fungi that previously has been available only in the research literature of many lands and languages. It should be of great value to students and teachers in general plant pathology and mycology as well as to specialists working with the smut fungi. The writing is clear, direct and understandable, the type and format are excellent. The Bibliography has full titles of all papers cited, and extends through 146 pgs., and the Index is well done. In this reviewer's opinion, illustrations of spores, spore masses, promycelia and sporidia of the fungi would have been a valuable addition to the book. *C. M. Christensen, University of Minnesota.*

★Plant Classification. LYMAN BENSON. 688 pgs., illus. D. C. Heath and Co., Boston, Mass. (1957)

Professor Benson has made a major contribution to the plant sciences with this handsome volume. It is designed as an elementary text in vascular plant taxonomy and there can be little question that it should succeed in attracting and holding the interest of college students. It is well written of course. The illustrations have been prepared effectively and reproduction of them is excellent. After a thorough but admirably concise discussion of plant parts used in identification, the basic principles of identifying plants and the major scientific concepts upon which plant classification is based there follows a taxonomic survey of the vascular plant groups. The keys and descriptions are carried only as far as the family level. Local flora keys are to be used to determine genera and species. Comments upon ecological relationships and economic aspects are included in the family descriptions and to this reviewer, these add much to the interest and value of the book. *Hiden T. Cox. AIBS.*

Plant Protection Conference, 1956. 315 pgs., illus. Academic Press Inc., 111 Fifth Ave., New York 3, N. Y. (1957) $9.00

The proceedings of the Second International Conference in Plant Protection (held at Fernhurst Research Station, England) now appears in book form through the auspices of Academic Press Inc. The Conference was sponsored by Plant Protection Ltd. (a subsidiary company of Imperial Chemical Industries Ltd.), an organization devoted to the development and utilization of better crop protection products, natural and synthetic. These aims could not be achieved without constant cooperation with authorities on entomology, mycology, botany, chemistry, physics and enginering and so the firm initiated a series of international conferences. Since increasing the world's food supplies also appeared a major preoccupation of the governments of the world, added impetus was given to the subject and the Conference. This volume contains the papers presented in 1956, the discussion that followed each presentation, and in some cases, extensive bibliographies to the literature.

MISCELLANEOUS

Life: An Introduction to Biology. SIMPSON, PITTENDRIGH and TIFFANY. 845 pgs., illus. Harcourt and Brace Co., 383 Madison Avenue, New York, N. Y. (1957)

Biology is so large a subject that the various sub-sciences of it tend at times to be raised to positions of completeness and independence; when biology is taught, this segmentation is often evident, and the unity of the subject matter is all too frequently lost. The only solution is a return to the basic principles which underlie all of biology, and the most important of these is the principle of evolution. With these thoughts in mind, the authors of this book have come up with a text for the beginner in biology which is at once unified in treatment, broad and equitable in scope, and very well illustrated and written. There are many biology texts on the market today, but in the opinion of the reviewer this one stands by itself; it is excellent, a credit to its authors and to its publisher. *C. P. Swanson, Johns Hopkins University.*

Bioenergetics. ALBERT SZENT-GYORGYI. 143 pgs., illus. Academic Press, 111 Fifth Avenue, New York, N. Y. (1957)

It is axiomatic that anyone concerned with modern biology needs a good command of, or at least a speaking acquaintance with, physics and chemistry. But to probe deeper requires more than a knowledge of the classical concepts; the author is firmly convinced that a re-orientation of thinking is necessary, and that to further the goals of biology and, specifically, to find out how "energy drives life", he suggests that biochemists and physiologists depart from the "letter-dash-letter" symbolism of present-day biochemistry and attempt to comprehend their subject in dimensions more akin to a quantum mechanical biochemistry. Energy transmission is a key to many of the problems of life, and Szent-Gyorgyi, with characteristic enthusiasm, approaches this by considering the mobility and utilization of energy among molecules and their rela-

tion to organized structure and function. The result is a stimulating series of short essays, and although the author states that his book is nothing more than a "guess" about bioenergetics, it is an educated, organized and integrated guess, fascinating even to one who is not a biochemist. *C. P. Swanson, Johns Hopkins University.*

Neuropharmacology. Transactions of the Third Conference. HAROLD A. ABRAMSON. 381 pgs., illus. Josiah Macy, Jr. Foundation, New York, N. Y. (1957) $4.50

This book shares the informal multi-discipline approach and process of the conference with readers. It contains ten brief presentations by different speakers highlighting some of the interesting aspects of each speaker's research. As expected, each presentation is interrupted and followed by comments, questions, criticisms and "group interchange", with participation in the penetrating discussions by the 19 members and 11 guests of the distinguished conference. The principal topics discussed are the effects of LSD-25 on snails, the blocking of the LSD-25 reaction in Siamese Fighting Fish, production and control of alcoholic cravings in rats, the action of alcohol on the central nervous system, stress situations in animals and the nature of conflict, the measurement of subjective responses, the effects of psychosomimetic drugs in animals and man, the origin of cortical surface potentials, serotonin and norepinephrine as antagonistic chemical mediators regulating the central autonomic nervous system, and brain response to drugs mapped through self-stimulation. This book gathers and integrates much information which is otherwise unpublished or widely scattered in the literature. *G. W. Casarett, University of Rochester, School of Medicine.*

***Soils and Soil Fertility.** LOUIS M. THOMPSON. 451 pgs., illus. McGraw-Hill Book Company, 330 W. 42nd St., New York, N. Y. (1957)

This second edition represents a nicely modernized and expanded version of the first. The book is surprisingly comprehensive and the author has done an excellent job of presenting recent research findings and new concepts. The treatment and coverage are entirely adequate for an introductory course in soil science at college level. In addition, the book merits scanning, or selective reading for refresher purposes, by soil scientists. Worthy of special mention are the chapters on Soil Formation and Classification, on Clay Minerals, Acidity and Alkalinity and on Nitrogen. In general, there are relatively few errors. Occasionally, unwieldy sentence construction and gaps in the development of information are evident. Also, much of the reference material antedates 1950 but most chapters include discussions of pertinent later research. Format, printing and binding are good. *Davis M. Batson, 9768 Damuth Drive, Baton Rouge, La.*

Dictionary of Microbiology. MORRIS JACOBS, MAURICE GERSTEIN and WILLIAM WALTER. 276 pgs. D. Van Nostrand and Co., Inc., Princeton, New Jersey. (1957) $6.75

This volume is an attempt to compile in one text what one can still find better defined in Bergey's Manual and a good medical dictionary. The claim that this dictionary offers clear and explicit definitions is certainly open to question. The volume is clumsy to use—e.g. turning to Moeller's method for staining, the reader is advised to see spore stain. Finding spore stain, the reader is referred to malachite green solution, Dormer's method and Wirtz's method. Turning to each of these references, one finds no mention of Moeller. *I. C. Mohler, AIBS.*

***Biogeography, an Ecological Perspective.** PIERRE DANSEREAU. 369 pgs., illus. Ronald Press, 15 East 26th St., N. Y. (1957) $7.50

With his wide experience of travel and extensive familiarity with ecological and biogeographical literature in many languages, Dansereau has been able to integrate all levels that compose the broad scope of biogeography into one concise volume. In a clear, synthetic approach he has made a "comprehensive ensemble" of diverse studies of "the origin, distribution, adaptation, and association of plants and animals." By numerous, instructive diagrams, maps and tables he presents many salient features of bioclimatology, life-forms of plants and vegetation, and biotic relations. The Ronald Press has done an outstanding printing job on good paper. Many other biologists, as well as ecologists and biogeographers, will welcome this book for the collation of numerous new approaches that have been diffused through the literature. Dansereau expands the old ideas of life forms of Raunkiaer and puts emphasis on the recent concepts of *ecosystems* and environmental dimensions divisible into *biocycles* and *biochores*. From the first chapter on the History of Biota through Bioclimatology, Synecology and Autecology, the discussions and illustrations bring the reader up to date and even project him into the future with exciting and provocative innovations. His consistent view of envirnomental relations reflected into the forms of the organisms and particularly the structure of vegetation is a salient feature. He presents clearly the dynamics of vegetational change during succession.

In fact, Dansereau suggests more environmental and inter-organism relations than he explains and he formulates many criteria and laws that he does not amplify sufficiently for some readers. His stress on phytosynecology will please plant geographers but the small material on animal ecology will disappoint some zoogeographers.

As a text the book can be used at the senior and graduate levels, especially with students that need an amplification of ecology and new ideas about many phases of biology. The last chapter on Man's Impact on the Landscape will help summarize human interference with nature for many students. *John H. Davis, University of Florida.*

Canadian Cancer Conference II. R. W. BEGG. 398 pgs., illus. Academic Press Inc., 111 Fifth Avenue, New York, N. Y. (1957) $8.50

This is the publication of the proceedings of the Second Canadian Cancer Research Conference held at Honey Harbour, Ontario, June 17-21, 1956. The volume contains 22 papers presented at the conference and grouped under the four general subjects: (1) the cell, (2) leukemia and chemotherapy, (3) hormones and cancer, (4) immunity and basic mechanisms. The papers vary from T. S. Hauschka's very thorough presentation to tissue genetics of neoplastic cell populations, a paper with 250 references, to K. J. R. Wightman's interesting discussion of a clinician's concept of leukemia, with no references; and from A. Lacassagne's paper on glandular cancers of hormonal origin, a subject that has been under investigation for over 50 years, to M. L. Barr and L. K. Moore's discussion of sex determination of somatic and tumor cells by the sex chromatin, a field of investigation limited to the last four years. Some of the more refreshing papers are by several of the Canadian investigators who are relative newcomers in cancer research. Some of the facts and ideas of the authors who have been in the field longer, although excellent, have already been published many times. The book is very well edited, and the printing, the quality of the paper, and the reproduction of the photographs are good. *W. E. Heston, National Cancer Institute, National Institutes of Health, Bethesda, Md.*

Mitochondria and Other Cytoplasmic Inclusions. Symposia of the Society for Experimental Biology. No. X. 198 pgs., illus. Academic Prses, Inc., 111 Fifth Avenue, New York, N. Y. (1957) $9.50

Of the eleven papers assembled in this small but comprehensive volume, there is an almost even distribution between those devoted primarily to the morphological, to the biochemical and to those essaying an integrated approach to these aspects of cell organelles. Most of the observations reported deal with cytoplasmic components of various vertebrate tissues, although such diverse systems as snail amebocytes, plant roots, insects (neurones, sarcocomes and spermatocytes) and several species of protozoa are represented. The Symposium was opened with a review of the "Golgi Controversy", and considering the vigor of the divergent attitudes on the subject, it is regrettable that the discussions are not included, and also that the titles of cited literature are not listed in the bibliographies. Behaviour of mitochondria, observed by phase contract and interference microscopy, suggests possible relationships to concomitant phenomena in the living cell. The organization of mitochondrial

enzyme systems, and the biochemical heterogeneity of cell fractions (mitochondria, lysosomes and microsomes) are considered in several papers that indicate that progress in this area will require the use of electron microscopy in conjunction with biochemical analyses of cell fractions. While a number of the participants in the symposium, in passing, refer to the inadequacy of methods which depend primarily on one class of fixative, there is no critical appraisal of this situation. In general the format of the book is quite good, and particularly commendable is the quality of the photomicrographs reproduced. *Leonard Nelson, University of Chicago.*

The Biological Action of Growth Substance. Symposium of the Society for Experimental Biology, No. XI. 344 pgs., illus. Academic Press, 111 Fifth Avenue, N. Y. (1957) $9.50

The Symposia of the Society for Experimental Biology in England have become known over the last decade as scholarly discussions of important topics in biology. The topics treated have varied from nucleic acids to evolution; and each volume has been at least partially successful. The present volume maintains the high standards expected from this series.

In a symposium held at Aberystwyth in September of 1956, the Society attempted to consider the action of growth regulating substances in plants, insects and mammals. The botanical topics include; apical dominance, germination inhibitors, auxin and root growth, hormones in fruit development, hormones in phototropism, organ formation in tissues cultured *in vitro*, neoplastic plant cells, hormones and sexuality in lower plants, and effect of microbial products on plant growth. The physiology of insect growth hormones is limited to a single chapter. Mammalian hormones are considered under the following headings; pituitary hormones and metabolic processes; hormonal regulation of foetal growth; localized formation of new tissue in adult mammals; antibiotics and animal growth; growth factors in tissue culture; growth hormones and embryonic organs cultivated *in vitro*; mammalian tumor cells and growth hormone dependence; and finally, hormonal regulation of zymogenic cells. As in previous books on this general topic, little coordination has been accompished between the hormones of plants and animals. Despite this failing, the book is of great value for all workers in the physiology of hormone action. *Arthur W. Galston, Yale University.*

Kinetics and Thermodynamics in Biochemistry. H. GEOFFREY BRAY and KENNETH WHITE. 343 pgs., illus. Academic Press, 111 Fifth Avenue, N. Y. (1957) $7.50

Most physiologists and biochemists trained in the last two decades have come away from their formal course work with the feeling that they wish they had had more time to devote to the subjects of kenetics and thermodynamics. The present brief book by Bray and White will be useful to those sufficiently versed in basic physical chemistry and biochemistry to work through the chapters by themselves. After a brief discussion of atoms and molecules and of particles in motion, the authors treat briefly the principles of thermodynamics, equilibria in aqueous solution, rates of reaction, kinetics of reaction systems, the kinetics of enzymic reactions and free energy and metabolism. The final chapter on kinetics and the whole organism is a bold and partially successful attempt to encompass, under the aegis of the book, such topics as luminescence, enzyme concentration in tissues, the regulation of differentiation, and the growth of organisms. Considering the complexity of the material, the book is extremely successful. *Arthur W. Galston, Yale University.*

★Biology. CLAUDE A. VILLEE. 615 pgs., 324 illus. W. B. Saunders Company, Philadephia, Pa. (1957) (3rd edition, 1957)

The fact that a text appears in a third edition before reaching the first decade of its life clearly indicates that it has found wide acceptance among college biology teachers. Such users will be pleased by the appearance and readability of the third edition of the Villee text, for it is a great improvement over previous editions. The choice of a two-column format, the larger page size, the more readable type have contributed to make this new edition an attractive book. The fine-grade paper has also improved the apeparance of the illustrations, especially the half-tones.

This reviewer is not sufficiently familiar with the detailed text of the second edition to be able to judge whether or not a thorough revision of the content has been made to include the recent advances in biology. According to the author's preface the chapters on genetics, evolution, and human biology have had such major revisions. In the preface the author also states the importance of biologic principles in a beginning text: "biology is not simply a mixture, in some predetermined ration, of botany and zoology, anatomy and physiology, heredity and evolution. . . ." This is a commendable statement, but merely adding a new chapter to elucidate these principles does not entitle the revision to a claim of being a text based on such principles. The sequence and presentation is still the traditional one, as in previous editions. Part two is descriptive botany, part three a similar treatment of zoology, part four an accumulation of facts in human anatomy and physiology with the attendant excessive terminology found in medical texts.

It is unfortunate that the majority of authors of biology texts are primarily zoologists. As a result there is an overpowering odor of the laboratory in the texts, a casual and outdated treatment of the entire field of plant biology. This inevitably results in a poor balance of material. The student using the Villee text, for example, will doubtedly believe that biology is essentially the study of a man-centered living universe; that its greatest rewards lie in facts discovered by peering through a microscope or laying bare the innards of a dogfish; and that plants are an incidental part of our lives, of little consequence. Why devote an equal wordage—two pages to be exact—to the Gymnosperms and to the Ascomyetes? Or to the Angiosperms and the Phaeophyta, each of which is allotted one page? All higher plants, Gymnosperms and Angiosperms, are together given more summary treatment than that given to the Coelenterates!

This reviewer also deplores the disproportionately limited space devoted to ecology, economic aspects of biology, and general inter-relationships among living things (especially conservation). With a complete page revision and new format, the author has an opportunity to correct some of these features and make a real contribution to the thankless task of writing a textbook. However, judged on the basis of accomplishment rather than omissions, the Villee text continues to be one of the outstanding current titles in its field. *Clarence J. Hylander, Silver Springs, Fla.*

Biology and Its Relation to Mankind. A. M. WINCHESTER and B. J. KASTON. 902 pgs., illus. D. Van Nostrand, 120 Alexander St., Princeton, N. J. (2nd edition, 1957) $7.25

With more than 30 general biology textbooks now available, it seems useless to review directly a new one or a new edition of one. It is obvious that no one of them has found universal approval, even for one type of biology course. In recent years some authors have attempted to combine the various approaches, in order to make their books suitable for a larger number of schools, and the present book is of this type. It appears to be primarily intended for the liberal arts biology course. It is very heavily slanted toward the human aspects of biology.

For liberal arts students who will take no other biology, this is probably justified, but the result is not biology but a broad view of hygiene, human ecology, and economic biology. The authors would probably be indignant at the charge that they have not presented biological principles effectively, yet they have failed in many cases to give the basis for an understanding of basic concepts. In this respect they are in the company of most other general textbook writers.

For example, the chapter on "The Classification of Living Things" deals extensively with the naming of animals but fails to make clear the basis of classification. In the same chapter an outline of the animal kingdom lists phyla in an order dictated by the chapter arrangement in the text, placing Ctenphora near the Mollusca, the Echinodermata between the Annelida and the Mollusca, and ten phyla between the Annelida and the Onychophora and Arthropoda.

In the chapter on "Biological Evolutions", a section on "Evidence from Serol-

ogy" fails to show how it is know that the amount of precipitation obtained is proportional to the degree of relationship. The nature and causes of biological evolution are treated very lightly in terms that are far too definite. Things which are probably true are often stated as fact, obscuring the most interesting part of biology —the vast number of probable explanations that haven't been actually proved. Most of these statements can be made about most textbooks of general biology. Perhaps they are not serious for liberal arts students, but for a real foundation in biology these books leave most of the important things to the instructor.

No biologists would fail to deal with evolution in a general course or in a general textbook. But how can one teach convincingly about a subject that is neither defined nor circumscribed? What is this evolution for which the writer lists evidences? After cautioning the reader to distinguish between fact and hypothesis in evolution, Winchester never again refers to this distinction but lists "evidences" that are unprovable along with those that are provable.

No one has yet succeeded in simplifying biology. The attempts in textbooks such as this are futile and harmful. This text may serve its intended purpose for liberal arts student, but it will not greatly promote the understanding of biological principles. The reviewer doubts if it will teach as much real biology as is required for a sound foundation in any of the life sciences. *R. E. Blackwelder, Box 500, Victor, N. Y.*

★Experimental Designs. WILLIAM G. COCHRAN and GERTRUDE M. COX. 611, pgs. John Wiley and Sons, 440 Fourth Avenue, New York, N. Y. (1957) $10.25

The text, *Experimental Designs*, by William G. Cochran and Gertrude M. Cox is a revision of the earlier book by the same authors. The text consists of a logical exposition of the practical aspects of experimental designs and a detailed presentation of most of the modern statistical designs. The mathematical models and assumptions are listed for each design and they are illustrated, in most cases, by practical examples. The book is an excellent reference work, both for the mathematical statistician as well as the non-mathematical statistician. Besides a reference text the book serves equally well for a classroom text, both for the mathematically inclined student as well as the non-mathematically inclined group providing the lecturer provides his own exercises and supplements the text with his own discussions.

The revision treats a number of new topics not mentioned in the first edition; namely, fractional replications of factorial experiments, response surfaces, generalized chain-block designs, and a number of other topics such as sequential experimentation, method of preference testing, and effect of errors in the weights on recovery of intra-block informations. A more complete coverage of the methods for estimating the number of replications is discussed.

It had been hoped by many that a more complete discussion of the general methods on statistical analysis than is now contained in Chapter 3 would have been included. This section of the text could have been expanded in the Cochran style to a great advantage of the reader. *Boyd Harshbarger, Virginia Polytechnic Institute.*

The Chemical Basis of Heredity. Edited by WILLIAM D. McELROY and BENTLEY GLASS. 848 pgs., illus. The Johns Hopkins Press, Baltimore, Md. (1957) $12.50

This volume is made up of the papers and discussions presented at a Symposium on the Chemical Basis of Heredity held in June of 1956, and contains thirty-seven papers reporting on a wide variety of recent investigations and speculations. The evidence has been drawn largely from three kinds of experiment: *in vitro* studies of the chemical and physical nature of nucleic acids, transforming agents, and viruses; studies in living systems, of the synthesis of nucleic acids, proteins, and virus particles; and studies of the behaviour of the genetic materials during replication and during genetic recombination in its various forms. Of special interest is the apparent hope of ultimately relating the biologically functional units of heredity as revealed by mutation, recombination, and position effects, with the knowledge and speculations concerning DNA structure, and perhaps also with the structure and synthesis of proteins. An extensive summary of the symposium by Bentley Glass has been included. This is an important book for specialists in related disciplines who wish to keep in touch with the recent work in this fundamental field where so many of the specialties meet. *H. B. Newcombe, Atomic Energy of Canada, Chalk River, Canada.*

Cytology and Cytogenetics. CARL P. SWANSON. 596 pgs., illus. Prentice-Hall, Inc., Englewood Cliffs, N. J. (1957)

In writing this textbook of cytology, the author has set for himself the task of asking "what has and what has not been done", and of ascertaining "the direction in which current and future research will lead us". The book should therefore be judged not only as an information source, but also as a guide and stimulus to further research.

As a source of information for advanced course work and for researchers in allied fields, this book presents in lucid and concise fashion a very large body of information relating to the structure and function of cells and chromosomes. One of the earlier chapters describes in detail the non-chromosomal structures of the cell, both microscopic and sub-microscopic, in relation to chemical function and composition. There is also a general chapter on the cell division process. The rest of the book is devoted largely to the chromosomes, and reviews in comprehensive fashion our present knowledge concerning their morphology, movements, variations in structure and number, crossing over and segregation, aberrations, chemistry, and evolution. The text is well documented, has a bibliography of somewhat over a thousand references, and contains a very usable and complete author and subject index. The style is clear.

As a stimulus to research the book must be judged by the manner in which it deals with the major areas of ignorance which fall within its scope, and the attention which it gives to the more recent advances in research. In both of these respects the author sets a high standard. *H. B. Newcombe, Atomic Energy of Canada, Chalk River, Canada.*

★Principles of Immunology. JOHN E. CUSHING and DAN H. CAMPBELL. 344 pgs., illus. McGraw-Hill Book Co., 330 West 42nd Street, New York 36, N. Y. (1957) $6.50

The authors of *Principles of Immunology* have stated in their preface that "It is designed primarily for college seniors, and graduate students who are being exposed to the principles and concepts of immunology for the first time." Considered in this light, the book should accomplish the purpose admirably. It is remarkably clear and concise, and the discussions of basic concepts should be easily understood by the beginning student of immunology. The authors have succeeded in confining references to the literature to a minimum and using as source material comprehensive reviews where possible. This is desirable particularly in a beginning text, since it should allow the student to grasp the basic concepts of the subject when first encounted without the break in continuity which many references and many names usually imposes.

The pattern of the book is a consideration of the subject matter in three major sections. Approximately ⅛ of the text is taken up with an introduction to the subject. The next section, consisting of approximately ½ of the book, is named *Biological Immunology*. It is primarily concerned with the genetic aspects of immunology. The remainder of the book is devoted to the treatment of antigens, antibodies, and their reactions. Noticeably lacking in this text is a consideration of medical immunology, and the authors have purposely avoided interjecting this area.

The book should prove to be an excellent text for biology and other science students who want or need only an introduction and basic understanding of the subject. For students majoring in immunology or microbiology, it may be less appropriate. Dr. Cushing is from the Santa Barbara College of the University of California, Dr. Campbell from the California Institute of Technology. *Wayburn S. Jeter, State University of Iowa.*

★Cell Physiology. ARTHUR C. GIESE. 534 pgs. W. B. Saunders Co., Philadelphia, Pa. (1957) $10.00

This book is based on a course in Cellular Physiology which Professor Giese has given for many years at Stanford University. The course is required of biology majors and is taken after general botany, zoology, physics and both introductory and organic chemistry. This background permits an upperclass approach but does not provide for vigorous physiochemical and mathematical treatment. General cellular functions are considered without much reference to organ or system physiology. Illustrations of principles come from animal, plant or microbial cells. The text is concise and clear; it is by no means light reading but it should certainly be understandable to students with backgrounds in general science. The chapter titles cover all the traditional topics of general or cellular physiology and each includes both classical and modern material. Each chapter concludes with lists of general and specific references, but documentation is less than would be expected in a sourcebook. The approach is that of a biologist and the biophysics and biochemistry which are included are well selected. This book will fill a real need as a text for undergraduate courses covering those aspects of cellular function which need to be appreciated before courses in the physiology of special groups are attempted. *C. Ladd Prosser, University of Illinois.*

Land and Crops of Nepal Himalaya; Scientific Results of the Japanese Expeditions to Nepal Himalaya 1952-1953. Vol. II. H. KIHARA. 529 pgs., illus. Fauna and Flora Research Society, Kyoto University, Kyoto, Japan. (1956)

This is the third report of the Japanese scientific exploring expeditions of 1952-53 in the northwest districts of Katmandu, Nepal. The first, the narrative of the expedition, was published in Japanese in Japan in 1954. The second, dealing with the fauna and flora, was reviewed in the *AIBS Bulletin*, Vol. 6, No. 2, pp. 33-34, April, 1956. The present book deals with the agriculture and the crops grown. Thirty Japanese and one American contributed the 29 chapters.

Following the preface is an account of the topography, vegetation, phytogeography, human influences and crop zones, of the mountain area of Nepal. The agricultural practices are described and profusely illustrated by photographs. The main part of the book deals with the principal crop plants, mostly according to varying studies of the plants grown in Japan from seeds collected in Nepal. They were studied taxonomically, genetically, and morphologically, and the races or varieties characterized and classified. In the barley studies 12 new varieties are described. The chromosomes of maize, not confined to Nepal taxa, are dealt with and a detailed account is given of 104 variables in the races grown in Japan, leading to a classification of this most valuable food plant. Other crops dealt with are: buckwheat, hemp, grain amaranths, spinach, Brassica taxa with 10 and 18 chromosomes, radishes, cauliflowers, sesame, various legumes, chilli, morning glories (*Pharbitis* nil), cucumbers, various drugs, *Agripyron* and related genera, *Echinochloa*, African millet, rice ecotypes, wheat and oats. None of the varieties endemic in Nepal were found by cultural experiments in Japan to be useful for improvement of Japanese varieties. In general their late flowering or maturing caused difficulty in getting seed in Japan. The Nepal varieties were less disease-resistant and had lower food value. Some values were derived for Nepalese agriculture through study of varieties in different parts of the country. *Egbert H. Walker, Smithsonian Institution, Washington, D.C.*

Biochemistry of the Amino Acids. ALTON MEISTER. 485 pgs. Academic Press, 111 Fifth Avenue, New York, N. Y. (1957) $10.00

Meister's volume is an authoritative reference for readers whose principle interests lie in the area of biochemical physiology. The approach is distinctly more chemical than physiological. The extensive use of literature citations lends the flavor of a contemporary biochemical review paper to the book. As a result of this style of presentation many passages fail to emphasize or evaluate recently recognized principles, although the results of key researches are carefully summarized. This limitation is particularly conspicuous in the sections on nutrition and microbial metabolism.

Biochemistry of the Amino Acids will be most useful as a reference supplementing basic texts in advanced biochemistry and in the reference libraries of men involved in biochemical research. Chapter I summarizes the basic chemistry of the natural amino acids. Chapter II, concerning amino acid nutrition, is perhaps the weakest section of the book from the standpoints of completeness and lucid exposition of basic principles. Chapters III and IV deal with the normal physiology and intermediate metabolism of amino acids. These sections are commendably thorough and explicit. Chapter V considers the role of the amino acids in several mammalian diseases. *Kendall W. King, Virginia Polytechnic Institute.*

Fundamentals of Chromatography. HAROLD G. CASSIDY. 447 pgs., illus. Interscience Publishers, 250 Fifth Ave., New York 1, N. Y. (1957) $9.75

Yale professor of chemistry, Dr. Cassidy approaches chromatography at the level of principle and does not attempt a detailed review or compendium of methods. The literature of paper chromatography alone has now reached vast proportions and papers on absorption and gas chromatography are multiplying at a rapid rate. Most people who seek aid in solving chromatographic problems are looking for a way to solve a particular problem. Books on methods exist but the "hows" and "why" of chromatography are more difficult to find. The author shows many of the principles of chromotography by the use of appropriate illustrations. He introduces popular usage of words for clarity and uses either deductive or inductive approaches—"whichever seems more felicitous". And says "I have written this book for everyone who would like to use chromatography, or who would like to improve his present methods or develop new methods. It is intended for all these users whether they are organic, inorganic, or biological chemists."

The Leukemias: Etiology, Pathophysiology, and Treatment. Edited by J. W. REBUCK, F. BETHELL and R. MONTO. 711 pgs., illus. Academic Press Inc., 111 Fifth Ave., New York 3, N. Y. (1957) $13.00

Leukemias are becoming of concern to physician and layman alike because of the increase in incidence of the disease with increased exposure to radiation. This timely book on the subject arose from an International Symposium held at the Henry Ford Hospital, Detroit, in March 1956. The symposium was suggested and sponsored by members of the hospital staff and brought together scientific experts from many countries. In writing about the resulting book, the senior editor says, "This volume accomplishes two purposes. It gives the present complex position of leukemic etiology and pathophysiologic disturbance, a much needed knowledge of detailed leukocytic functions and comprehensive thought on the therapy of the leukemias. It establishes a basis of comparison with the earlier works of Downey and Forkner in this field in the late thirties and thus makes it possible to see with some clarity the extent of progress made. Actually the progress has been extensive and at an accelerated rate of speed."

Some Principles of Energetics in Biochemical Reactions. IRVING M. KLOTZ. 64 pgs., illus. Academic Press Inc., 111 Fifth Ave., New York 3, N. Y. (1957) $3.00

The trend to interpret biological phenomena in molecular terms has presented many biologists with the task of learning something about the principles of energetics. The necessary mathematical background is often missing and this alone renders most textbooks on the subject unreadable. That biologists may acquire a "reading knowledge" of the language of thermodynamics, the author has prepared this small volume. Chapter headings are: The Concept of Energy: The First Law of Thermodynamics; The Concept of Energy: The Second Law of Thermodynamics; The Free Energy or Chemical Potential: A Criterion of Feasibility of a Material Transformation; The Dependence of Chemical Potential on Concentration; Group Transfer Potential; "High-energy Bond"; Some Laws of Physicochemical Behavior; and Energetics from a Molecular-Statistical Viewpoint. The author is professor of chemistry at Northwestern University.

★A Textbook of Histology. ALEXANDER A. MAXIMOW and WILLIAM BLOOM. 628 pgs., 1082 illus. W. B. Saunders Co., West Washington Square, Philadelphia, Pa. (7th edition, 1957) $11.00

"Maximow and Bloom" have been bywords in the field of histology for over two decades. The senior author is now deceased but the junior author has undertaken the extensive revision made necessary by recent advances in knowledge of the submicroscopic world. Many old histological problems have been solved but new ones have arisen as the power of analytical instrumentation methods has increased. Dr. Bloom writes "It is thus necessary to present medical students with an orienting text which not only describes the structure of the human body as seen with the optical microscope but which also considers relevant submicroscopic analysis and discusses function." A number of electron micrographs have been used as illustration; phase contrast photomicrographs have also been appropriately utilized.

★The Microbial World. ROGER Y. STANIER, MICHAEL DOUDOROFF and EDWARD A. ADELBERG. 682 pgs., illus. Prentice-Hall Inc., Englewood Cliffs, N. J. (1957)

The authors write in their preface, "Microbiology is now making fundamental contributions to the concepts of biology as a whole. At the same time, microbiologists have come to realize that microorganisms, whatever their singularities, obey the same general laws as other living systems. This book is an attempt to present a modern synthesis of microbiological knowledge in a form intelligible to the beginner". Believing that an acquaintance with the basic concept of biology is necessary to fledgling microbiologists, a special section (very clearly indicated by a red page) is included at the end of the book. This section "The Biological Background" neatly summarizes biological concepts. The book as a whole is amply illustrated with original photographs, line drawings, charts and tables. The three authors are professors of bacteriology at the University of California.

Microbial Ecology. The Seventh Symposium of the Society for General Microbiology. Edited by R. E. O. WILLIAMS and C. C. SPICER. 388 pgs., illus. Cambridge University Press, 32 East 57th St., New York 22, N. Y. (1957) $6.50

The papers in this Symposium, held in London, April 1957, summarize current knowledge and views on many aspects of the ecology of microorganisms. One section is devoted to those effects of the environment that can be studied by physical and chemical methods. Another group of papers discuss the effects of interactions between microbes; further papers describe the methods of survival of fungi and protozoa in nature, and the effect of higher organisms on microbial survival and distribution. The editors write in the preface, "Microbial ecology is, in its present stage of development, less quantitative than the ecology of animals and plants, but the papers in this volume reveal the extensive development of quantitative investigation that has been carried out in recent years and will form a valuable basis for further studies."

Methods of Biochemical Analysis. Vol. 4. Edited by DAVID GLICK. 362 pgs. Interscience Publishers, 250 Fifth Ave., New York 1, N. Y. (1957) $8.50

A fourth volume in this important series will be welcomed by biochemists and biologists alike. Contents include: Determination of Carotene, E. M. Bickhoff; Determination of Vitamin A, N. D. Embree, S. R. Ames, R. W. Lehman, and P. L. Harris; Measurement of Polyunsaturated Fatty Acids, R. T. Holman; Determination of 17,21-Dihydroxy-20-ketosteroids in Urine and Plasma, R. H. Silber and C. C. Porter; The pH-Stat and its Use in Biochemistry, C. F. Jacbosen, J. Leonis, K. Linderstrøm-Lang and M. Ottesen; Assay of Sulfatases, K. S. Dodgson and B. Spencer; Determination of Serum Acid Phosphatases, W. H. Fishman and H. M. Davidson; Determination of Amino Acids by Use of Bacterial Amino Acid Decarboxylases, E. F. Gale; Determination of Succinic Dehydrogenase Activity, T. P. Singer

CORRECTION!

In our ad in the August program issue of the AIBS Bulletin, the titles of the books were transposed, that is, the title of one book appeared with the copy for the other and vice versa. This error caused the prices to be incorrect also. The correct prices are:

A MANUAL OF AQUATIC PLANTS $6.50

SPRING FLORA OF WISCONSIN $2.50

We hope that this mistake has not inconvenienced you.

THE UNIVERSITY OF WISCONSIN PRESS
430 Sterling Court
Madison 6, Wisconsin

AT LAST—

An authoritative presentation of human heredity in a clear-cut, easily understood style.

HEREDITY AND YOUR LIFE

A. M. Winchester, Ph.D.
Stetson Univ.

A New Approach:

Dr. A. M. Winchester, well known for his lucid presentation of scientific subjects in his textbooks, now brings forth this important contribution to biological literature. A book which deserves a place in the library of every biologist.

Illustrated with a superb collection of photographs and diagrams.

The Reviewers Say:

"—a fine example of the modern trend to popularize science."

"This book tells a fascinating story of human life—so fascinating that you'll find it difficult to lay aside once you get into it."

"We sat down to scan it and didn't get up until after reading every word of it.—HEREDITY AND YOUR LIFE provides up-to-the-minute, accurate information of inestimable value."

"Understanding of human heredity is so important that this book deserves to find a very large number of readers."

"Here is a highly readable, well illustrated presentation of human genetics—the author has succeeded in bridging the gap between the technical aspects of heredity and common understanding."

333 pages, Illus. $5.00
at your bookstore

For 20% professional discount send orders to publisher—Post paid when payment accompanies order.

VANTAGE PRESS
120 West 31 St., New York City 1

INSECTS OF WESTERN NORTH AMERICA,

Revised Edition, by EDWARD O. ESSIG.

Designed as a handbook for students, entomologists, farmers and gardeners, this book is not merely an economic entomology, but is a general manual of Western insects. This revision includes 100 additional species and many new illustrations.

Coming Spring 1958

AN INTRODUCTION TO PLANT TAXONOMY by GEORGE H. M. LAWRENCE.

This text emphasizes the vascular plants: ferns, gymnosperms, and flowering plants. Among the subjects treated are plant structures, systems of classification, plant nomenclature, and plant identification, including the preparation of herbarium specimens.

1955, 180 pages, $3.65

AN INTRODUCTION TO ORNITHOLOGY

by GEORGE J. WALLACE. Requiring little or no background in the zoological sciences, this comprehensive and well-balanced textbook of ornithology includes chapters on morphology, behavior, life-history, distribution, economic importance and conservation.

1955, 444 pages, $6.00

TAXONOMY OF VASCULAR PLANTS

by GEORGE H. M. LAWRENCE. For students in the beginning or intermediate stages of the study of systematic botany, this book provides information on the theory, principles, and operating procedures followed in plant taxonomy, plus an accounting of all the families of plants known to grow in North America.

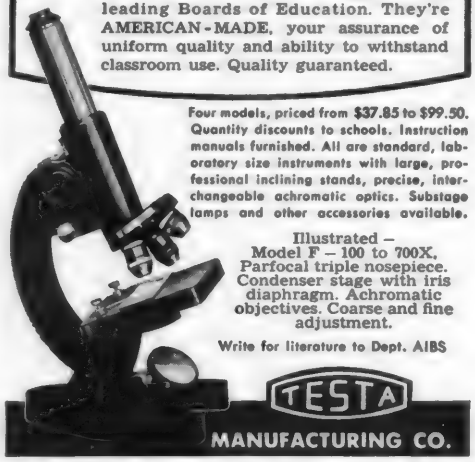
1951, 823 pages, $9.00

The Macmillan Company

60 FIFTH AVENUE, NEW YORK 11, N. Y.

SERVING SCHOOLS at Low Cost

Year after year, TESTA Microscopes are winning more and more new friends. Now used in over 12,000 schools. Approved by leading Boards of Education. They're AMERICAN-MADE, your assurance of uniform quality and ability to withstand classroom use. Quality guaranteed.



Four models, priced from $37.85 to $99.50. Quantity discounts to schools. Instruction manuals furnished. All are standard, laboratory size instruments with large, professional inclining stands, precise, interchangeable achromatic optics. Substage lamps and other accessories available.

Illustrated – Model F – 100 to 700X. Parfocal triple nosepiece. Condenser stage with iris diaphragm. Achromatic objectives. Coarse and fine adjustment.

Write for literature to Dept. AIBS

TESTA MANUFACTURING CO.

10122 East Rush St., El Monte, Calif.

POPULATION STUDIES: Animal Ecology and Demography

Cold Spring Harbor Symposia on Quantitative Biology

Volume XXII (1957), about 375 quarto pages, with numerous figures

Authoritative reviews by ecologists, demographers, anthropologists, population geneticists, and mathematicians, of experimental procedures and analytical techniques of common interest to ecology and demography. 35 papers, plus edited discussions.

Previous volumes still available: IX (1941) Genes and Chromosomes; XIII (1948) Biological Applications of Tracer Elements; XIV (1949) Amino Acids and Proteins; XV (1950) Origin and Evolution of Man; XVI (1951) Genes and Mutations; XVII (1952) The Neuron; XVIII (1953) Viruses; XIX (1954) The Mammalian Fetus; XX (1955) Population Genetics; XXI (1956) Genetic Mechanisms.

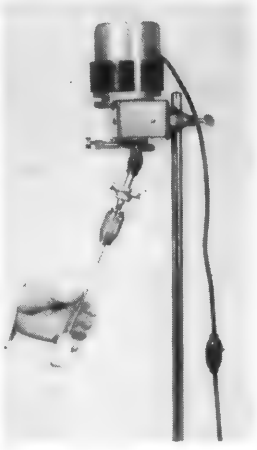
Prices: Single volumes—IX-XV, $7; XVI-XXII, $8. Sets—any two volumes, $14, plus $5 for each additional volume.

Address:

Biological Laboratory

Cold Spring Harbor, New York

Eberbach



CON-TORQUE POWER UNIT FOR TISSUE HOMOGENIZATION

- **For Culture Work . . . Pathological and Biological Studies**
- **Constant Torque Provides Continuous Positive Grinding Action**

Now you can homogenize tissue effortlessly for culture work as well as pathological and biological study. Eberbach's new variable-speed Con-Torque gives constant full torque at all speeds and eliminates possibility of tissue jamming the pestle in grinding vessel. Speeds from 0 to 350 r.p.m. are selected by means of a lever which is locked at a setting by a thumb screw. Unit may also be utilized for stirring jobs; a fixed 3/8" coupling is included as an accessory.

No. 77-889D 115 volt, 60 cycle A.C. $130.00

Write for Bulletin No. 545B

Eberbach Corporation
Ann Arbor, Mich.
Scientific Instruments & Apparatus
Established 1849

ZOOLOGY

BY ALFRED M. ELLIOTT

SECOND EDITION

746 PAGES $7.00

". . . A well organized text with exceptional illustrations." —R. R. Huestis, University of Oregon

". . . Well-written, clear and interesting. The photographs are excellent, and the drawings are remarkably fine. The 3-dimensional inclusion lends clarity and interest." —Helen A. Mowry, Skidmore College

The Century Biological Series

The revision of this widely used textbook in general zoology incorporates the results of significant research on a range of subjects extending from blood circulation in amphibians to effects of radiation on genes. In addition to 19 entirely new drawings, nearly one hundred of the original 482 line drawings have been revised to improve their effectiveness in conveying entire biological principles.

". . . The dynamic approach used in this text is the most appealing that I have seen in any text. It catches the interest and holds it." —John F. McMillan, University of Wichita

"The second edition is even better than the first. The illustrations are particularly telling." —Roland Holroyd, LaSalle College

APPLETON-CENTURY-CROFTS, INC. **35 West 32nd Street, New York 1, N. Y.**

sound texts
for sound teaching

A CHECKLIST OF HOLT BOOKS IN THE BIOLOGICAL SCIENCES

Marsland ● **PRINCIPLES OF MODERN BIOLOGY, Third Edition**

An integrated treatment of modern research and traditional principles, to equip the general student with basic knowledge of how biology relates to him and his community, while preparing the major for more advanced work.

1957

Altenburg ● **GENETICS, Revised Edition**

Eight new chapters highlighting the most recent findings in the field, with lucid presentation of classical genetic principles. Ample material for a full year's study, yet easily adapted to a semester course.

1957

McEwen ● **VERTEBRATE EMBRYOLOGY, Fourth Edition**

A clear and careful revision of a recognized text, which offers a complete and up-to-date account of the embryology of vertebrate forms. Citations of the most recent experimental work amplify the descriptive material to make available the important advances in the subject.

1957

Schopp
Dawe ● **A LABORATORY MANUAL IN HUMAN PHYSIOLOGY**

Designed to teach basic physiological principles through correlated laboratory experiments. Thoroughly class-tested to polish its clarity, test its accuracy, and check its appeal for the student.

1957

Miller
Haub ● **GENERAL ZOOLOGY**
1956

Johnson
DeLanney
Laubengayer ● **GENERAL BIOLOGY**
1956

Fuller ● **THE PLANT WORLD, Third Edition**
1955

Fuller
Tippo ● **COLLEGE BOTANY**
1954

AND ANNOUNCING THE FORTHCOMING PUBLICATION OF

THE LIVING BODY, Fourth Edition
Charles H. Best
Norman B. Taylor

An introduction to Physiology for colleges and for medical and dental students. Comprehensive in coverage, with new illustrations. Important material, written in relatively simple language.

1958

Henry Holt and Co.
383 Madison Ave.
New York 17, N. Y.

Human implications of zoology emphasized for the non-science major

ZOOLOGY

Without sacrificing basic principles, the authors of ZOOLOGY have written a text incorporating modern zoological concepts. Presented with sufficient human implications to interest many students who do not become professional biologists, this beginning text is written in clear, simple language that is not too long and ponderous, and is well illustrated with clear concise drawings of the specimens themselves. Following the well known educational principle of beginning with the known, and progressing to the unknown, this book starts with the vertebrates which are more familiar to freshman students, then to the simple cell, and finally to the more complex multicellular phyla. This book covers Introduction to Science, Scientific Methods, Basic Physics and Chemistry, Classification, Anatomy and Life History of a Frog, Anatomy and Physiology of Organ Systems of Man, Cell Structure, Animal Phyla, Embryology, Genetics, Evolution, Phylogenetic Considerations and Ecology.

By CLARENCE J. GOODNIGHT, Ph.D., Associate Professor of Zoology, Purdue University, Lafayette, Indiana; and MARIE L. GOODNIGHT, M.S. Former Instructor in Biology, Purdue. 1954. 730 pages, 217 illustrations. $5.75.

3rd Edit.—Francis-Farrell

INTEGRATED ANATOMY and PHYSIOLOGY

Incorporating the most recent developments in physiology and integrating them with anatomy, this new 3rd edition of INTEGRATED ANATOMY AND PHYSIOLOGY is a comprehensive yet compact text containing the essentials of human anatomy and physiology. Designed for use on the college level in schools that combine courses in anatomy and physiology, there is still sufficient material on either subject for a separate course in that area. Much of the material has been rearranged for clearer presentation and two new intermediary chapters have been added.

By CARL A. FRANCIS, A.B., M.D., Associate Professor of Anatomy, Department of Anatomy, Western Reserve University, Cleveland, Ohio; and GORDON L. FARRELL, M.D., Assistant Professor of Physiology, Department of Physiology, Western Reserve University. 1957. 3rd edition. 641 pages, 367 illustrations, 31 color plates. $5.85.

Excellent Texts and Lab Manuals for Basic Zoology, Anatomy Courses

The first book to stress the broad generalizations of zoology and integrate them into a unified whole

Hickman's INTEGRATED PRINCIPLES OF ZOOLOGY

By showing the historical periods during which the great zoological concepts where developed, and how these discoveries are linked with the cultural life of today, Dr. Hickman makes introductory zoology a dynamic subject for freshman students. Here is a book that shows the integration of each major group of animals into an evolutionary blueprint of the animal kingdom, and clearly brings out man's niche in the balance of nature. This book covers basic principles and concepts of zoology, man's relationship to the animal world, historical development of the zoological sciences, structural and physiological comparison of man's body with other animals, integration of principles that underlie patterns of animal life. An important feature of this work is the topic, "Biological Principles"—at the beginning of each major group of animals which ties together each phylum into a unified whole. Particularly interesting to students of general zoology are the chapters on "Interesting Adaptations and Transition Forms", "Present Status of Evolution", and "Zoological Interests of Man".

By CLEVELAND P. HICKMAN, Ph.D., Professor and Head of the Department of Zoology, DePauw University, Greencastle, Indiana. 1955. 956 pages, 442 illus. $6.50.

An excellent lab manual for general zoology courses

Hickman's LABORATORY STUDIES IN INTEGRATED ZOOLOGY

Planned for use with Hickman's textbook, this guide also lends itself to any one year or one semester general zoology or biology course that emphasizes concepts and principles of zoology. Emphasis is on descriptive exercises with step-by-step procedures where the student does most of his own scientific investigation, thereby saving the laboratory instructor the necessity of having to answer many questions. Written with more factual information and more illustrative material than other manuals, this lab book lets the student appraise the work he is doing with the broader principles he learns in class. With a definite sequence of presentation, this manual avoids the outline or choppy methods of presentation.

By CLEVELAND P. HICKMAN, Ph.D., Professor and Head of the Department of Zoology, DePauw University, Greencastle, Indiana; and FRANCES M. HICKMAN, A.B., Assistant in Zoology, DePauw University, Greencastle, Indiana. 1957. 353 pages, illustrated. $3.75.

Topics arranged so that instructor can use own teaching sequence

Potter's LABORATORY OUTLINE FOR GENERAL ZOOLOGY

Designed as a laboratory guide to an elementary course in zoology, or the zoological portion of a general biology course, the 4th edition of this manual has been brought up-to-date and arranged so that the instructor can easily change the teaching sequence to suit himself. It covers the life history and morphology in some cases, development of all main groups of animals, except reptiles, with sufficient material for a two semester course. Or, by following the authors suggestions, certain sections can be selectively chosen for a one semester study. Technical terms are italicized, and blank, and partially complete drawings are easily detached for transfer to a notebook. In this revision, the section on the rat has been strengthened, and the comparative attitude is emphasized.

By GEORGE EDWIN POTTER, Ph.D., Professor of Zoology, A and M College of Texas, College Station, Texas. In preparation.

Gladly sent to teachers for consideration as texts

The C. V. Mosby Company

3207 Washington Blvd. St. Louis 3, Mo.

Girl in charge of loose ends

The loose ends we're talking about are tiny bits of tobacco that can fall into your mouth, your purse or your pocket. This young lady makes sure that American Tobacco Company cigarettes are as free from annoying loose ends as possible.

Sample quantities of these cigarettes come regularly from the production lines to The American Tobacco Company's Research Laboratory. The cigarettes are tumbled and bounced for a prescribed period of time in the laboratory's "loose-ends machine" (see inset). After this shake-up, any tobacco that has fallen from the cigarettes is carefully collected and weighed. If the amount ever exceeds the small minimum allowed, the cause of the excess is traced and eliminated.

This is one of the many hundreds of laboratory tests made daily. It's another example of the ceaseless attention to detail that helps maintain the superior quality of The American Tobacco Company's cigarettes.

The American Tobacco Company

FIRST IN CIGARETTE RESEARCH

LUCKY STRIKE • PALL MALL • HIT PARADE • HERBERT TAREYTON • FILTER TIP TAREYTON